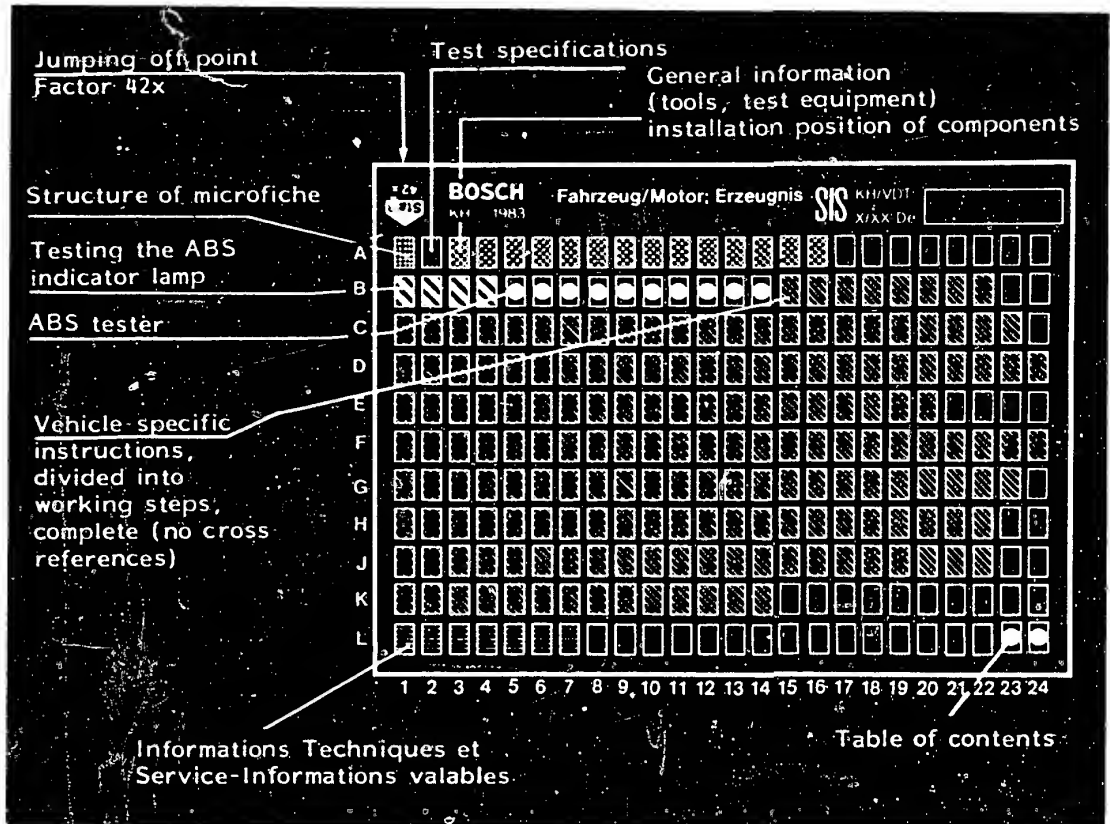


Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E 16	Product/assembly/test step	
	Vehicle/engine	

Coordinate

3. Limits of section



Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C 6

A1

Trouble-Shooting Plan



1. TEST SPECIFICATIONS

For reasons of safety, the ABS must only be tested using the ABS tester (test starting on Coordinate B 1).

The test program contains all the important information on testing and replacing the components.



TEST EQUIPMENT AND TOOLS

<u>Description</u>	<u>Designation</u>	<u>Part No.</u>
<u>ABS tester</u>	ETT 016.00	0 684 101 600
<u>Dynamic brake analyzer</u>	e.g. BPS 100	0 680 012 ..
	or BPS 101	0 680 013 ..
	or BPS 104	0 680 018 ..
	or BPS 105	0 680 019 ..
<u>Charging and bleeding device</u>	e.g. ATE Part No.	3.9302-1000.4 ¹⁾
<u>Bleeder connection</u> for connecting the charging and bleeding device to the fluid reservoir of the master cylinder	ATE Part No.	3.9302-0702.2 ¹⁾
<u>Bleeder hose</u>	ATE Part No.	3.3590-2300.1 ¹⁾
<u>Auxiliary hose</u>	ATE Part No.	3.9302-0704.2 ¹⁾
<u>Brake-pedal actuating device</u>	ATE Part No.	3.9312-0100.4 ¹⁾

1)

Obtainable from:

Alfred Teves GmbH
Guerickestr. 7

6000 Frankfurt/M

A3

Test equipment and tools

BMW 628 CSi, 633 CSi, 635 CSi



<u>Description</u>	<u>Designation</u>	<u>Part No.</u>
<u>Pressure tester</u> Tester for low and high pressure testing of hy- draulic brake systems		e.g. ATE Part No. 3.9305-0200.4 ¹⁾
<u>Double-end flare</u> <u>nut wrench,</u> 9 x 11 mm		Hazet Part No. 612 ²⁾
<u>Vessel</u> for catch- ing the brake fluid approx. 1l		
<u>Brake fluid</u>	BMW-DOT 4 or ATE SL- DOT 4 or Veedol Disc Brake Fluid DOT 4 or Castrol Disc Brake Fluid DOT 4	
<u>Electrics tester</u> or <u>multimeter</u> for trouble- shooting	ETE. 014.00	0 684 191 400 commercially available

¹⁾ Obtainable from
Alfred Teves GmbH
Guerickestr. 7
6000 Frankfurt/M.

²⁾ Firma Hazet
5630 Remscheid

A4

Test equipment and tools

BMW 628 CSi, 633 CSi, 635 CSi

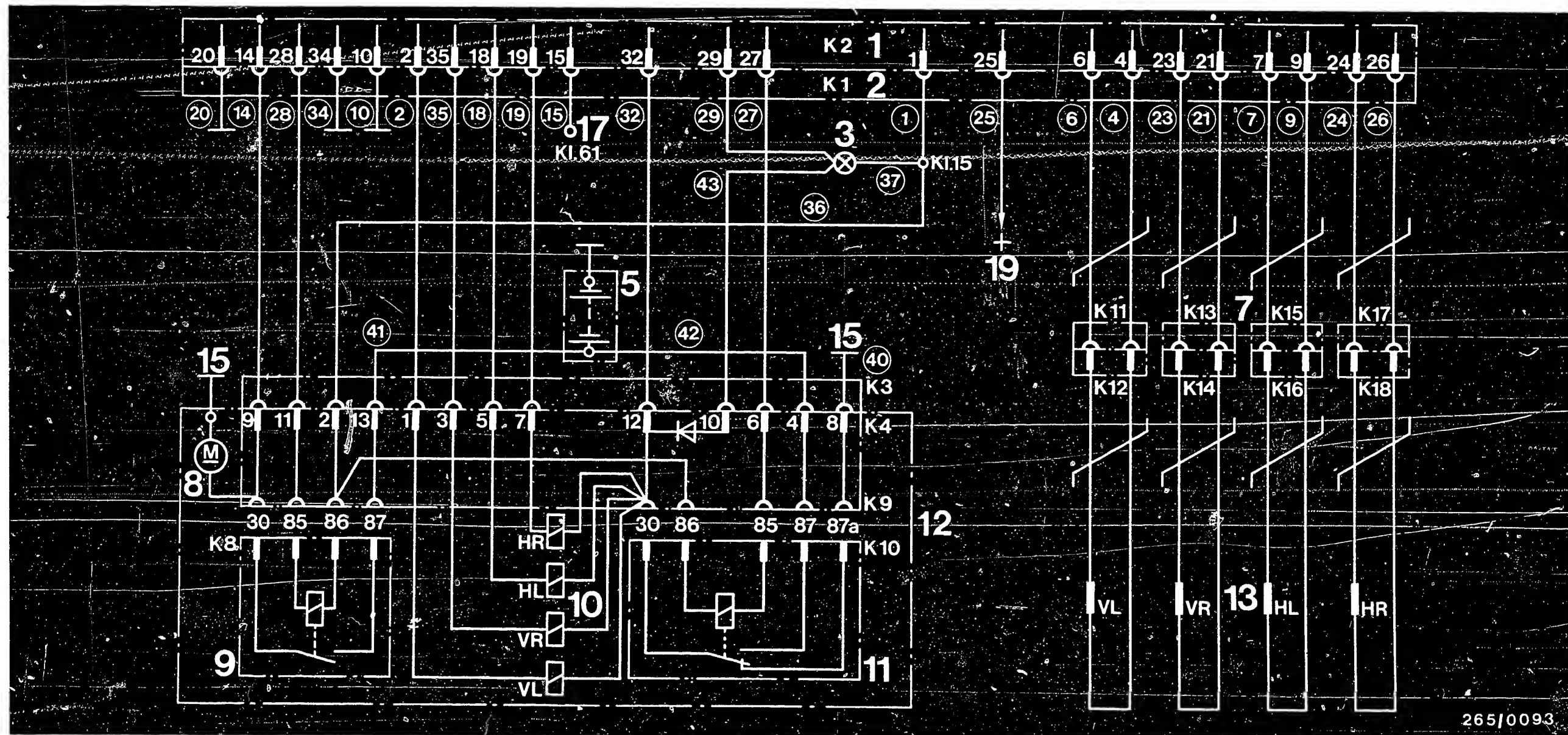


2.1 Auxiliary materials

Use only BMW genuine brake lines.

<u>Description</u>	<u>Number</u>
Grease for wheel-speed sensors	Molykote Longterm 2
Protective caps for brake lines	Bosch Part No. 1 900 508 002 (100 pieces)
Protective caps for connection of brake lines to hydraulic modulator	Bosch Part No. 1 900 508 004 (100 pieces)





265/0093

3. Electrical circuit diagram of ABS

- 1 = Electronic controller
- 2 = Multiple plug (35-pin)
- 3 = ABS indicator lamp
- 5 = Battery
- 7 = Plug-in connectors
- 8 = Return-pump motor
- 9 = Return-pump relay
- 10 = Solenoid-operated valves

- 11 = Valve relay
- 12 = Hydraulic modulator
- 13 = Wheel-speed sensor
- 15 = Ground terminal in engine compartment on front left
- 17 = To alternator

- 19 = To stop-lamp switch (as of generation 2B)
- VL = Front left
- VR = Front right
- HL = Rear left
- HR = Rear right

K1, K2 etc. = Connector numbers

A6

Electrical circuit diagram
BMW 628 CSi, 633 CSi, 635 CSi



A7

Electrical circuit diagram
BMW 628 CSi, 633 CSi, 635 CSi

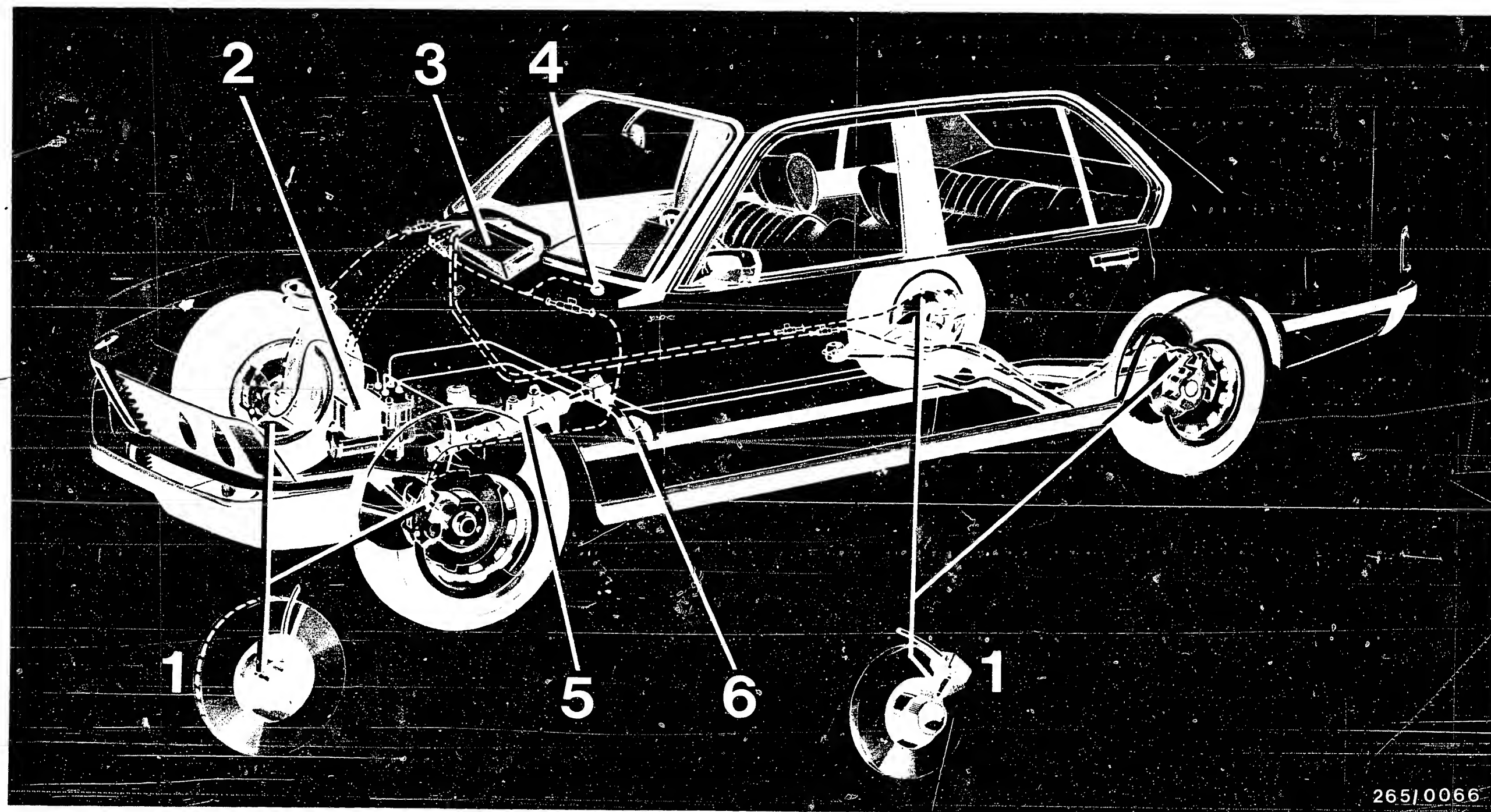


4. Installation position of components

The indications "right" and "left" always refer to the forward direction of travel.

- ABS indicator lamp: In instrument panel
- Front-axle wheel-speed sensors: One at both left and right in the steering knuckles
- Rear-axle wheel-speed sensors: One at both left and right near the brake callipers
- Hydraulic modulator: In engine compartment on left-hand side in front of brake master cylinder
- Ground terminal for ABS: In engine compartment at front left, near battery
- Controller: In equipment compartment in front of firewall





265/0066

- 1 = 4 wheel-speed sensors on wheels
 2 = Hydraulic modulator in engine compartment
 3 = Controller in glove compartment

Installation position of components

- 4 = Indicator lamp in instrument panel
 5 = Tandem brake master cylinder
 6 = Brake pedal

- Lines from controller to hydraulic modulator
 - - - Lines from wheel-speed sensors to controller
 ——— Dual-circuit diagonal brake system

A9

Installation position of components
 BMW 628 CSi, 633 CSi, 635 CSi



A10

Installation position of components
 BMW 628 CSi, 633 CSi, 635 CSi



5. Bleeding of brake system

After replacing the hydraulic modulator, bleed brake system and perform high-pressure and low-pressure tests.

Take care when handling brake fluid!

- a) Only pour brake fluid into containers where there is no danger of accidental human consumption of the fluid (fatal dose 100 cm³).
- b) Even slight traces of mineral oil cause the brake system to fail. If the brake fluid is colorless or yellowish take particular attention since in this case the danger of a mix-up is at its greatest. If mineral oil is detected in the brake system or if there is a suspicion of same, the entire brake system must be thoroughly rinsed with brake fluid. The brake master cylinder must also be replaced.
- c) Do not allow brake fluid to come into contact with the vehicle paintwork as it contains components which dissolve paint.
- d) Brake fluid is highly hygroscopic, i.e. it absorbs humidity thus reducing the boiling point. Thus, brake fluid may only be stored in thoroughly sealed containers.

Note:

In the course of its service life the boiling point of the brake fluid drops due to the continuous absorption of humidity from the atmosphere. Thus, vapor bubbles may form in the brake system if the brakes are subjected to extremely heavy braking conditions. The brake fluid must therefore be replaced annually, preferably in the spring.



Bleeding

- When using a bleeding device for bleeding, pay attention to the manufacturer's operating instructions. In order to eliminate all air bubbles from the tandem brake master cylinder, the brake pedal must be completely depressed at least three times during the bleeding process with the bleeder screws open.
- If bleeding is performed by "pumping" with the brake pedal, close the appropriate bleeder screw each time before releasing the brake pedal to prevent air from being sucked in via the thread of the bleeder screw.
- Slowly release brake pedal to ensure that sufficient brake fluid is sucked in from the fluid reservoir during the return stroke of the plunger.
- The bleeding process is complete when clear, bubble-free brake fluid emerges via the bleeder hose.

Important!

The brake fluid pumped out during bleeding may not be reused since it may contain foreign matter which would then get back into the brake system.

- Fill fluid reservoir with brake fluid as far as "max" mark.



6. Checking the brake system for leaks

	<u>High-pressure test</u>	<u>Low-pressure test</u>
Line test pressure gauge pressure	50 bar	2-5 bar
Test duration	40 seconds	5 minutes
Pressure drop of set value	8% (max)	0 (constant)

Note

The leakage check, which must be performed in both brake circuits, comprises high-pressure and low-pressure testing.

A13

Leak check

BMW 628 CSi, 633 CSi, 635 CSi



6.1 High-pressure test

- Connect pressure tester to fixed calliper. To do this, unscrew bleeder screw and screw in fitting. Then bleed pressure tester.
- Allow engine to run at medium speed and generate as high a vacuum as possible by suddenly releasing the accelerator pedal.
- Using the brake-pedal actuating device depress the brake pedal until a line pressure of 50 bar gauge pressure is generated. Then secure brake pedal in this position.
- During the test period of 40 seconds, the pressure drop may not be greater than 8% of the set value. If the pressure drop is greater than this figure, the leak (brake master cylinder, brake hoses, brake lines, brake callipers) must be sought and eliminated, or the hydraulic modulator must be replaced.

6.2 Low-pressure test

- Release brake pedal actuating device until a line pressure of 2 ... 5 bar gauge pressure is indicated on the pressure gauge.
- During a test period of 5 minutes the set pressure may not drop. If a drop in pressure is detected, the leak must be sought and eliminated, and the brake master cylinder or the hydraulic modulator must be replaced.



7. General notes on repair work and brake system

The ABS is basically maintenance-free, but when performing work on ABS-equipped vehicles, pay attention to the following:

1. If welding work is to be performed with an electric welding unit, the electronic controller plug must be removed.
2. During painting work the electronic controller may be subjected to a maximum of 95°C for brief periods and a maximum of 85°C for lengthy periods (approx. 2 hours).
3. After replacement of the hydraulic modulator, controller, wheel-speed sensors and wiring harness as well as work involving the ABS assemblies (e.g. work performed after accidents), the entire ABS system must be checked using the tester. Make absolutely sure that the brake lines are laid correctly.
4. After any work on the brake system, the brake system must be bled and high-pressure as well as low-pressure testing performed. All joints are to be checked for leaks.
5. If the battery has been removed, the cable clamps at the two terminals must be properly tightened after re-installation.
6. Do not use a fast charger for starting the engine.
7. Never disconnect the battery from the vehicle electrical system with the engine running.



8. Disconnect the battery from the vehicle electrical system when fast charging.
9. Make sure that all connectors of the wiring harness are securely connected.
10. Never connect or disconnect the wiring-harness plug of the controller with the ignition switched on.
11. For safety reasons, the hydraulic modulator must not be repaired, but the complete unit must be replaced. Exceptions to this are the return-pump relay and the valve relay. Both relays may be replaced. No screws on the hydraulic modulator may be loosened apart from the brake-line connections. After loosening it is no longer possible to get the brake circuits leak-tight! Danger!



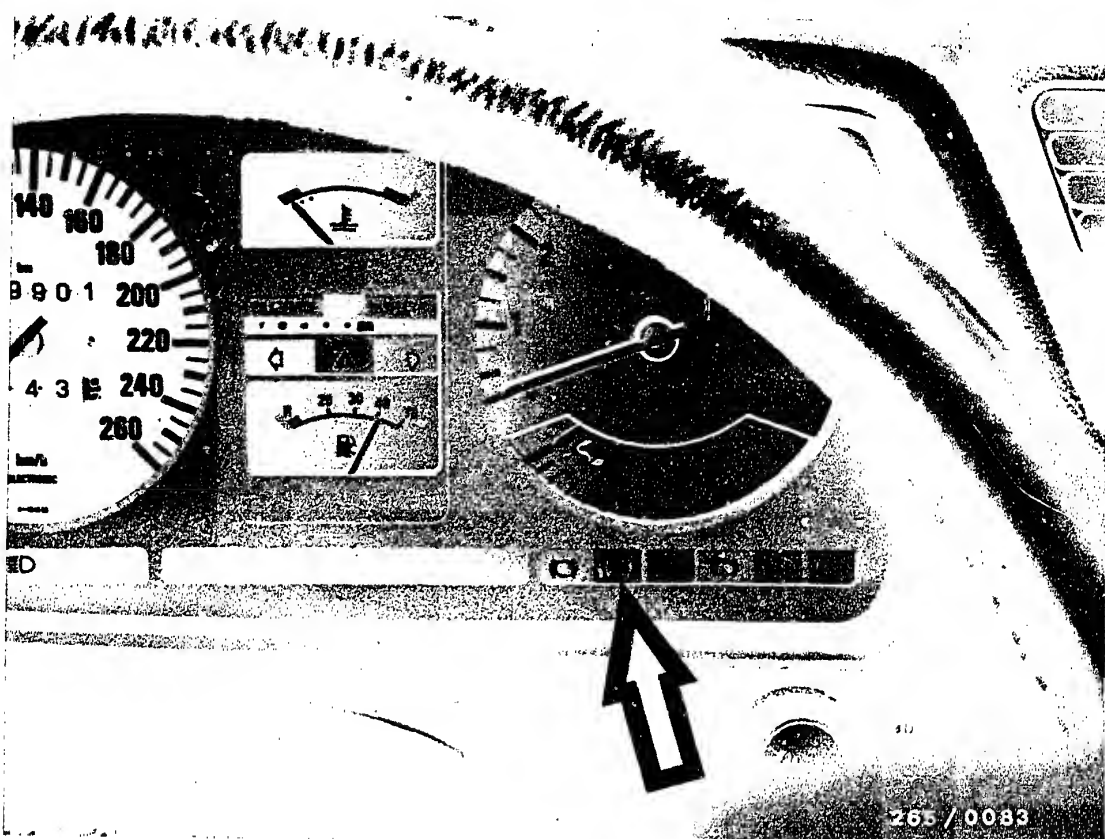
8. Operation and checking of ABS indicator lamp

Vehicles equipped with ABS come into the workshop with one of the following customer complaints:

- Indicator lamp not lighting up after switching on the ignition.
- Indicator lamp not going out after reaching idle speed.
- Indicator lamp lighting up again when driving or lighting up occasionally.

Confirm the complaint yourself before checking the entire ABS system with the ABS tester. For reasons of safety, the ABS may only be checked using the ABS tester. The ignition must always be off for connecting the ABS tester as well as when connecting or disconnecting the controller. If you have detected a fault with the ABS tester, always disconnect the controller before performing further trouble-shooting. In the following you are informed of the correct function and malfunction of the ABS indicator lamp.





Arrow = ABS indicator lamp in instrument panel

8.1 Indicator lamp function

The indicator lamp lights up when the ignition is switched on and goes out as soon as the engine starts running. The controller receives the information "engine running" via terminal 61 of the alternator. When the speed of the vehicle exceeds approx. 6 km/h for the first time, the ABS carries out a self-check. If the ABS SYSTEM is defective the indicator lamp lights up at the latest when the speed of the vehicle exceeds 12 km/h (or 24 km/h in the case of controller 2B). In this connection, the wheel-speed sensor voltages are checked. Continuous lighting up of the indicator lamp advises the driver that the ABS is switched off. The normal brakes still work.

Incorrect indicator-lamp indications are:

- Indicator lamp not lighting up after switching on the ignition.
- Indicator lamp not going out after reaching a idle speed.
- Indicator lamp lighting up again when driving or lighting up occasionally.

The lighting up of the ABS indicator lamp advises the driver that the ABS is not in working order.

General note

Occasional lighting up of the indicator lamp may be caused by an insufficiently charged battery. The lamp only lights up as long as there is undervoltage, e.g. after switching on loads at idle.



9. ABS tester

General notes on how to use the tester

The tester checks functions of the controller, of the hydraulic modulator, of the wiring harness and also checks the components of the antiskid system (ABS).

The ABS tester measures actual values which are compared with the respective nominal values.

If the actual value indicated differs from the nominal value, carry out trouble-shooting as directed in the "trouble-shooting" column.

The tester should be connected between the controller and the ABS wiring harness (switch off the ignition when connecting the tester).

Do not drive the vehicle with the tester connected.

The respective test steps are set with the program-selector switch (1 to 24).

For the wheel-speed sensors and the hydraulic modulator depress the round buttons according to the test chart.

Test steps with a high power requirement are not triggered until after the illuminated key has been pressed.

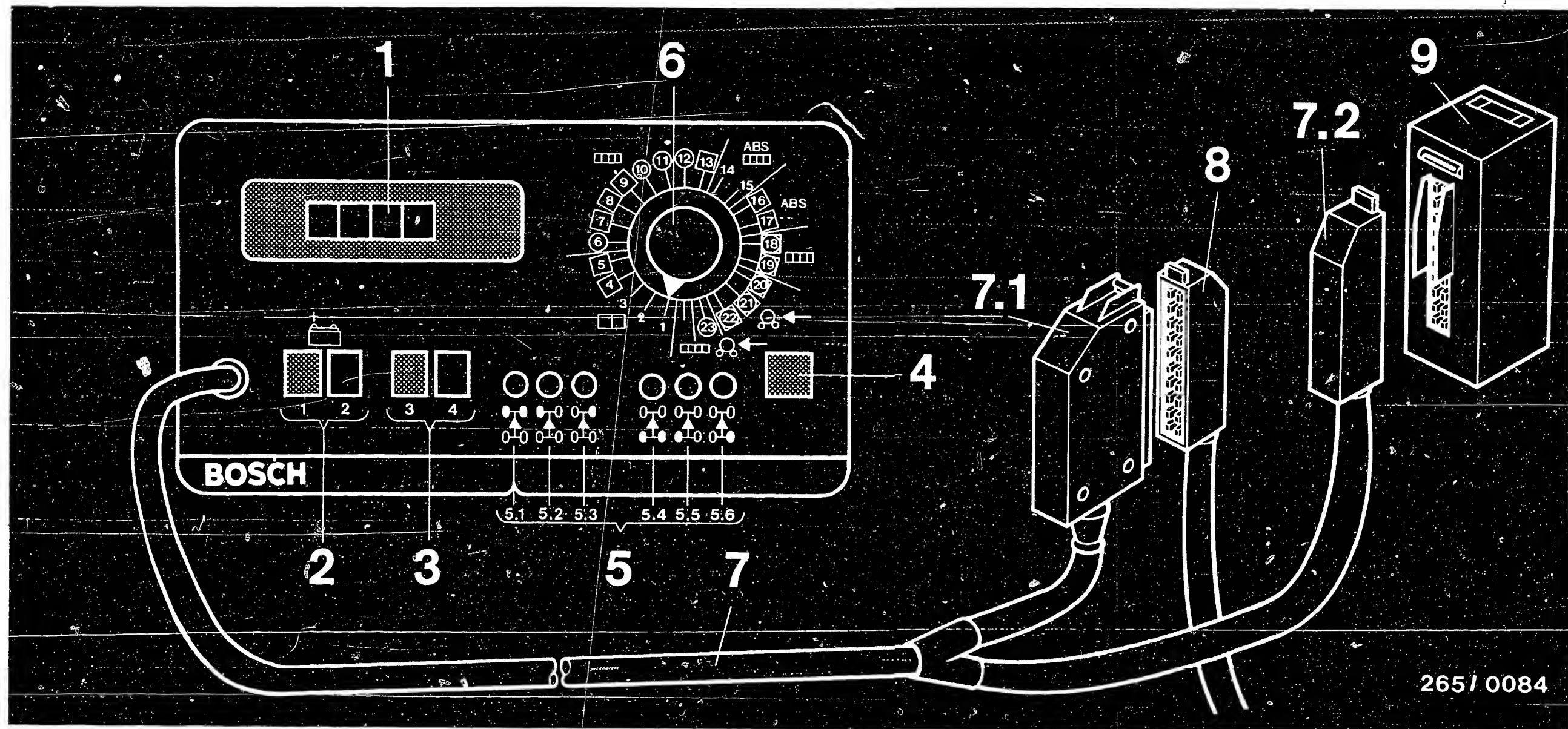
The illuminated key lights up automatically in the respective test steps.

The actual value is indicated either by the green-red lamps or by the digital display.

The test steps with the program-selector switch in positions 20...23 can only be performed on a dynamic brake analyzer.

The ABS tester must be converted for generation 2B.





265 / 0084

- 1 = Digital LED display unit
- 2 = Lamp 1 (green): battery voltage O.K.
- 3 = Lamp 2 (red): battery voltage too low
- 4 = Lamp 3 (green): return-pump relay and valve relay as well as overvoltage protection O.K.
- Lamp 4 (red): return-pump relay and valve relay as well as overvoltage protection defective
- 5 = Illuminated key, yellow, for triggering individual test steps
- 6 = Channel selection key (wheel selection)
- 5.1 = Front axle (FA)

- 5.2 = Front left wheel (FL)
- 5.3 = Front right wheel (FR)
- 5.4 = Rear axle (RA)
- 5.5 = Rear left wheel (RL)
- 5.6 = Rear right wheel (RR)
- 6 = Program-selector switch

- 7.1 = Connection to wiring harness
- 7.2 = Connection to adapter cable
- 9 = ABS controller (installed in vehicle)

B5

ABS tester

BMW 628 CSi, 633 CSi, 635 CSi

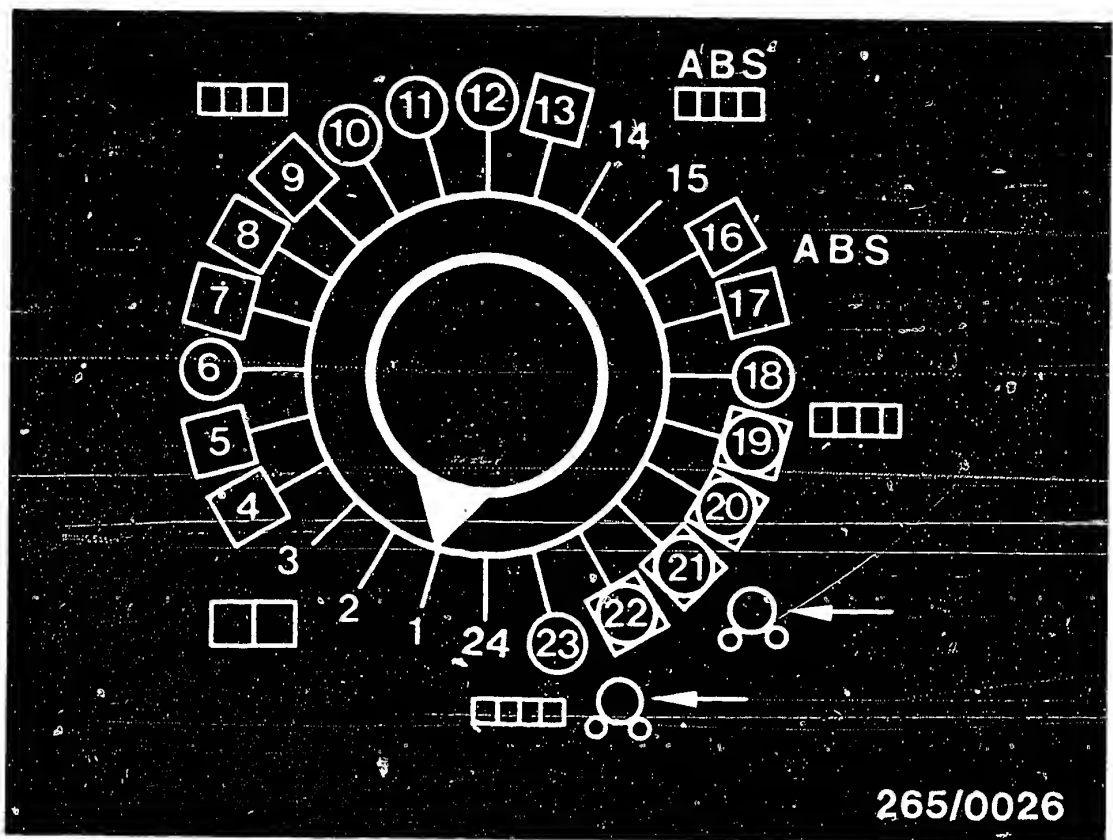


B6

ABS tester

BMW 628 CSi, 633 CSi, 635 CSi








Program-selector switch (description of symbols)


Program-selector switch for 24 program steps

Symbols for additional operations:

Program step with  : press illuminated key (Item 4)

Program step with  : press respective channel selection keys (Items 5.1 to 5.6)

Program step with  : press channel selection key (Items 5.1 to 5.6), press illuminated key (Item 4)

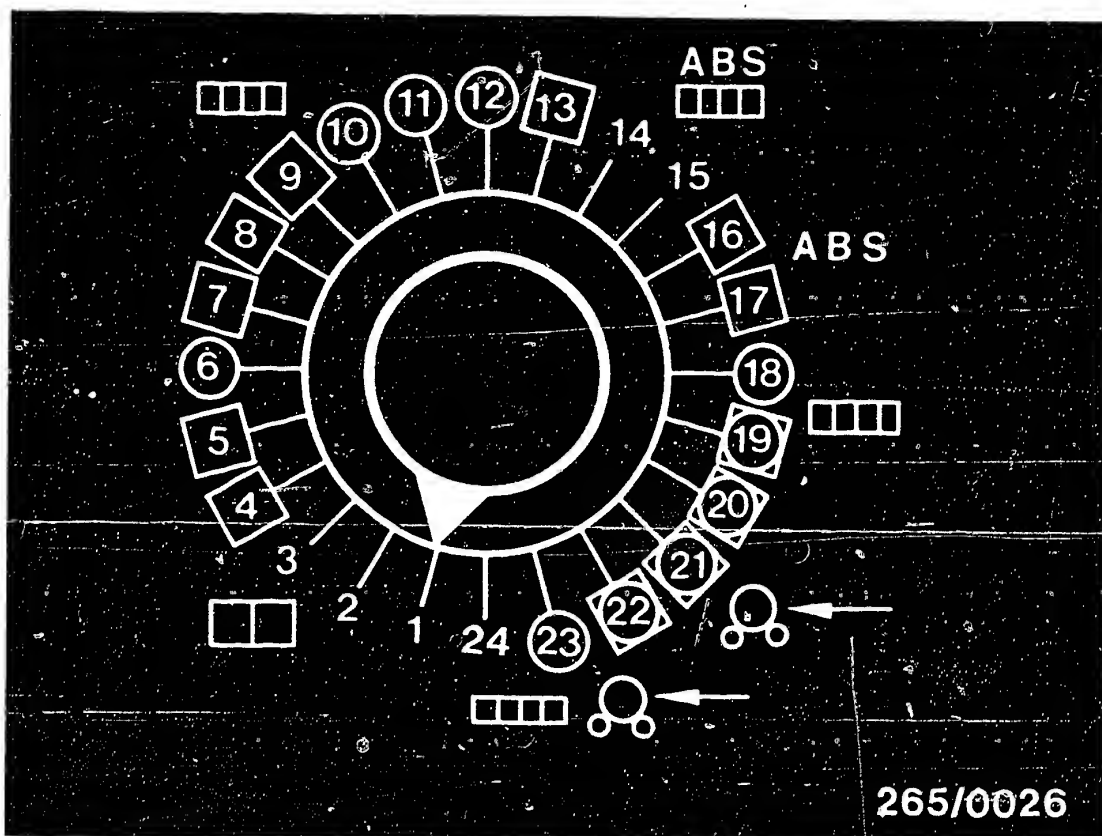
Program step with  : first drive front axle and then rear axle of vehicle onto dynamic brake analyzer.

B7

ABS tester

BMW 628 CSi, 633 CSi, 635 CSi





Program-selector switch (description of symbols)
(continued)

Display:



Red-green display, lamp units
(Item 2 or Item 3)

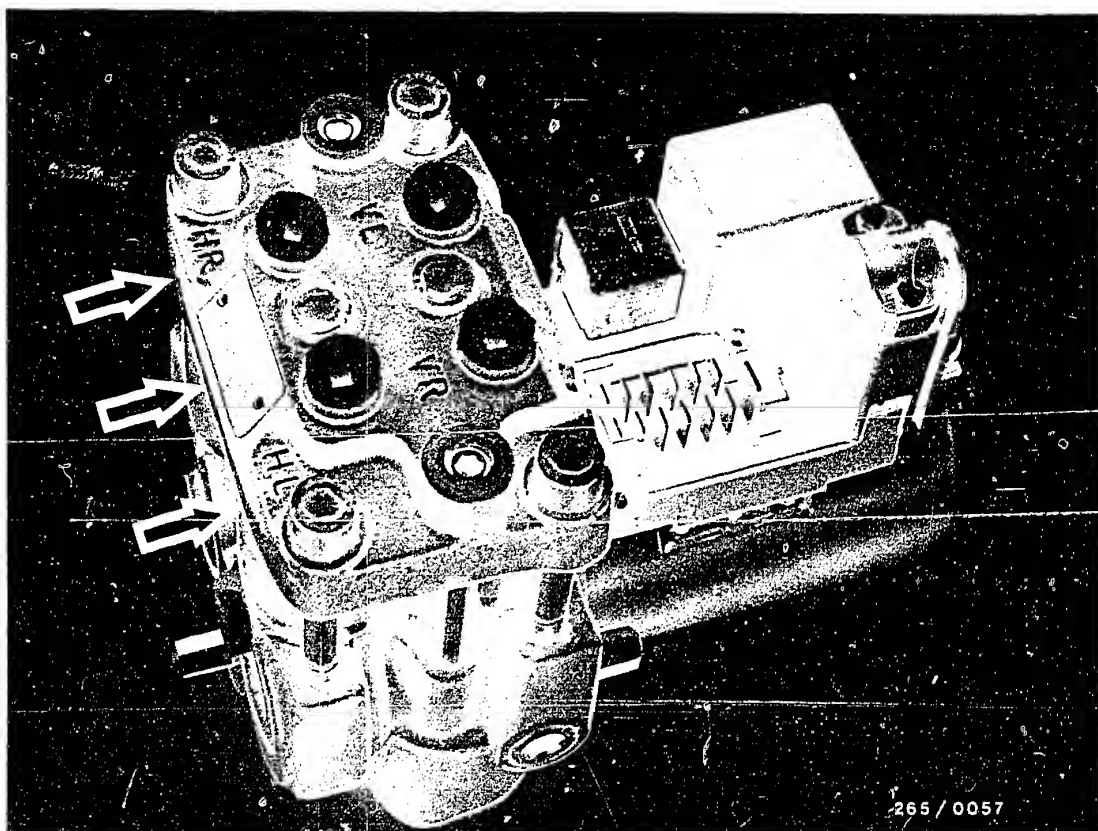


Digital display unit (Item 1)

ABS :

Watch indicator lamp in vehicle.





10. Test conditions for testing with ABS tester

- Check the ground connection of the return pump for security.
- Check the hydraulic connections on the hydraulic modulator for leaks (visual examination). Pay particular attention to joints (arrows).

B9

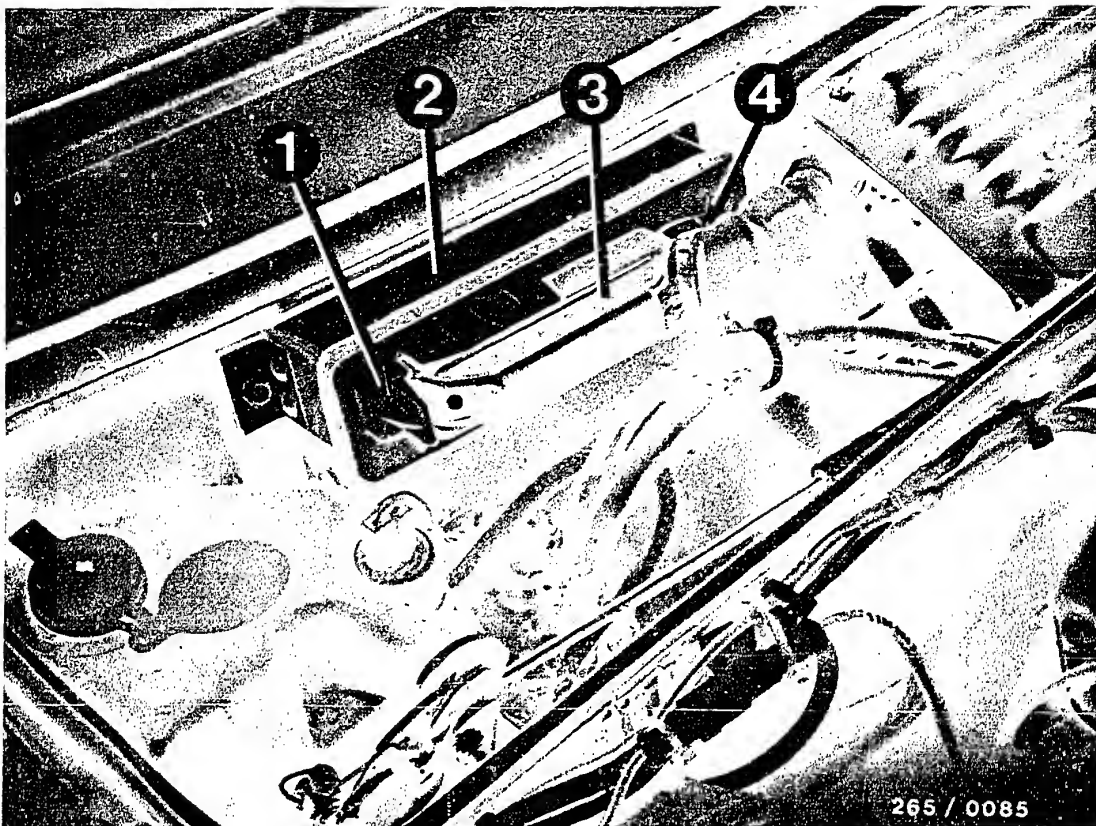
Test conditions

BMW 628 CSi, 633 CSi, 635 CSi



- If the ABS indicator lamp lights up occasionally when driving (e.g. after switching on loads) and goes out again automatically, check the battery and the power supply (generator, regulator and voltage drops).
- If the ABS indicator lamp lights up constantly and does not go out, check the following points:
 - ➔ Is the multiple plug correctly fitted to the controller and has it locked in position?
Are all plug contacts OK? Have the spring contacts locked in position?
 - ➔ Has the V-belt broken? (generator not providing any power, charge indicator lamp and ABS indicator lamp light up).
 - ➔ Is there voltage at generator terminal 61?
Plug connector and cable to ABS controller OK?
 - ➔ Pay particular attention to testing for loose contacts on wheel-speed sensors with program-selector switch in position 10.





1 = Encoding block
2 = Controller

3 = Multiple plug (ABS
wiring harness)
4 = Spring

- Connect ABS tester to controller (1) and ABS wiring harness (2).

Caution!

Connect and disconnect the controller only with the ignition switched off.

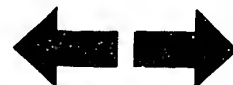
The controller is in the equipment compartment in front of the firewall. Pull cover on cable leadthrough slightly apart and pull off. Press back spring (4), hinge up multiple plug (3) and unhook from encoding block (1).

Unscrew controller if necessary (2 screws on left and right).

B11

Test conditions

BMW 628 CSi, 633 CSi, 635 CSi



- For testing with the tester, switch on the ignition in all program-selector switch positions (tester operates on power supply from vehicle battery).
- Watch tester lamps 1 and 2 in all program-selector switch positions.

Caution!

Do not drive the vehicle with the tester connected.

For testing generations 2 and 2B, the tester must be converted to meet the latest requirements.

General note on trouble-shooting

Check all cables for short circuit to ground and for contact with positive cables, and watch for any indications of wear, abrasion and pinching.



11. Testing with the ABS tester

Note on test steps 1...48

In the following test steps a broad, white surrounding frame in the "Operation" column indicates which operation has to be changed compared with the preceding test step.

B 13

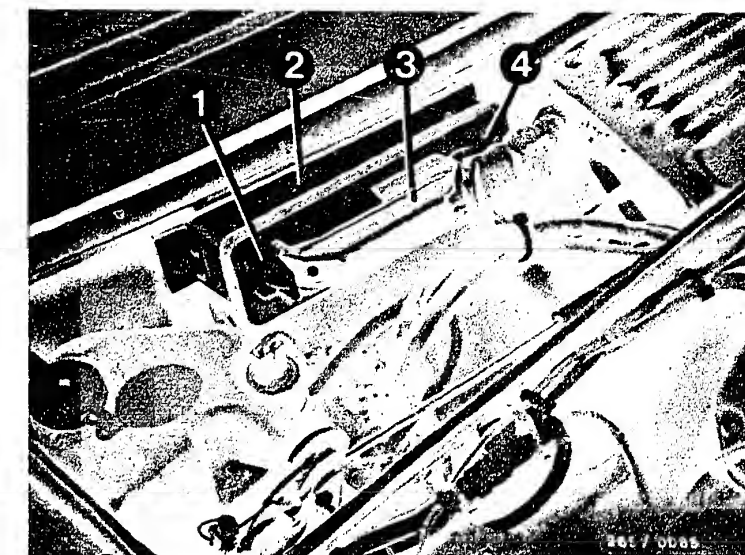
Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



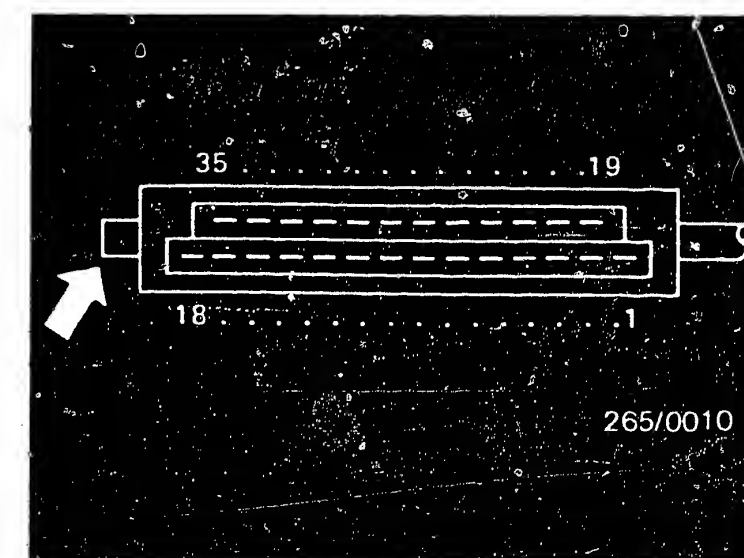
TEST STEP 1 Note: This test step is important for all the following test steps, i.e. watch lamps 1 and 2 throughout the entire test procedure.
For testing generations 2 and 2B, the tester must be converted to meet the latest requirements.

<u>Operation:</u>		<u>Reading:</u>	<u>Testing:</u>
Program-selector switch position	1 to 24	Lamp 1 (green) must light up	Component: Power supply
<u>Operation in vehicle:</u> Switch on ignition		<u>Note:</u> Lamp 1 (green) = OK. Lamp 2 (red) = fault. Watch for occasional lighting up. If reading OK, continue testing with next test step.	<u>Operation:</u> Monitoring of power supply in all program-selector switch positions. <u>Malfunction:</u> 1. No reading 2. Green lamp goes out and red lamp lights up, possibly only briefly as long as there is undervoltage.



- 1=Encoding block
2=Controller
3=Multiple plug (ABS wiring harness)
4=Spring

Top view of multiple plug K1 (35-pin with terminal numbers)
Arrow = Lug with mechanical coding



Trouble-shooting (switch off ignition):

1. No reading:

- Multiple plug not correctly attached.

Check the following cables:

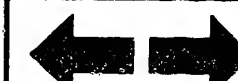
- Positive cable from driving switch term.15 to multiple plug term.1
- Negative cable from multiple plug term.10 to ABS ground
- ABS ground terminal must be bare down to the metal and must not have any contact resistance.

Continued on B 16/B 17

B14 Test with ABS tester
BMW 628 CSi, 633 CSi,



B15 Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 1 (continued)

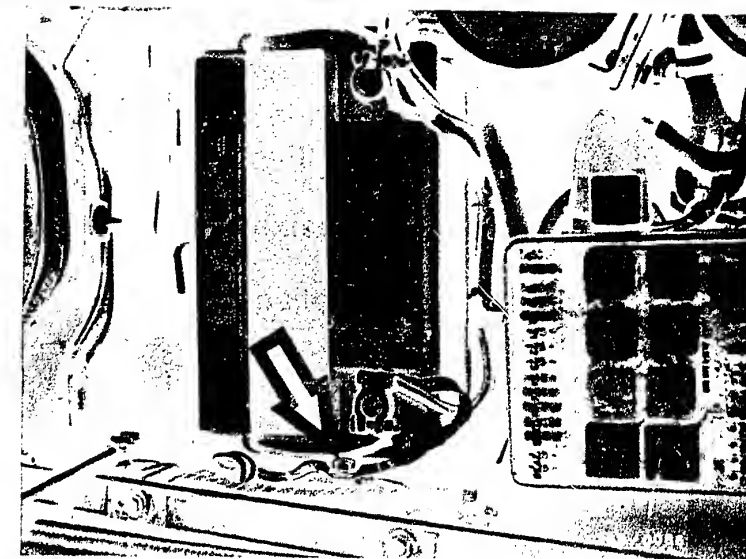
Lamp 2 (red) lights up or lights up occasionally while testing:
Stop testing and eliminate the cause of the trouble.

Causes of the trouble:

1. Battery insufficiently charged. Charge battery or allow engine to run.

2. High voltage drops across ABS ground terminal.
Ground terminal must be bare down to the metal.

After eliminating the fault, perform the complete test program.



Arrow=Ground terminal
for pump motor
and ABS

B 16

Test with ABS tester

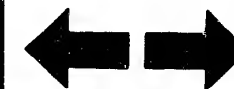
BMW 628 CSi, 633 CSi, 635 CSi



B 17

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi

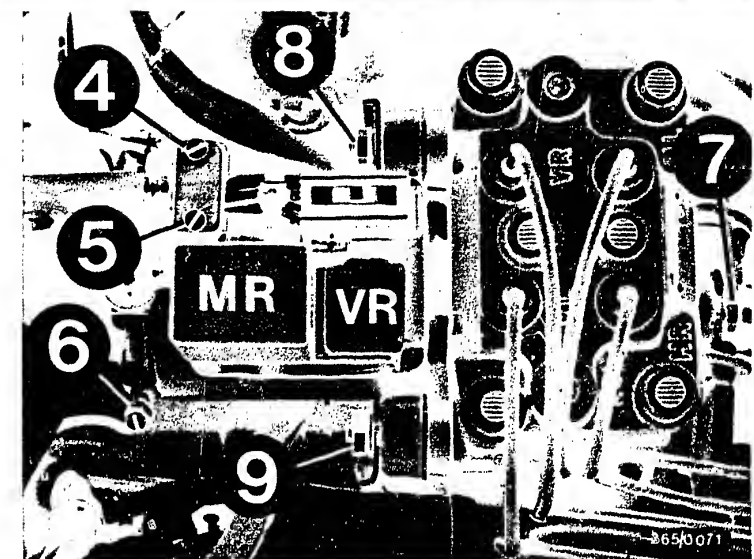


TEST STEP 2			
Operation:		Reading:	Testing:
Program-selector switch position	1	Lamp 3 (green) must light up	<u>Component:</u> Valve relay
<u>Operation in vehicle:</u> Switch on ignition		If reading OK, continue testing with next test step.	<u>Operation:</u> Off-position
			<u>Malfunction:</u> Lamp 4 (red) lights up

Trouble-shooting (switch off ignition):

- Valve relay defective.
Caution! Use only relay with correct electrical terminal assignment.
- Ground connection has high contact resistance or open circuit.
- Test the following cables for continuity:
 - From ground to plug K 3/term.8
 - From K4/term.8 to valve relay term.87 a
 - From K4/term.12 to valve-relay plug term.30
 - From K3/term.12 to multiple plug K1/term.32

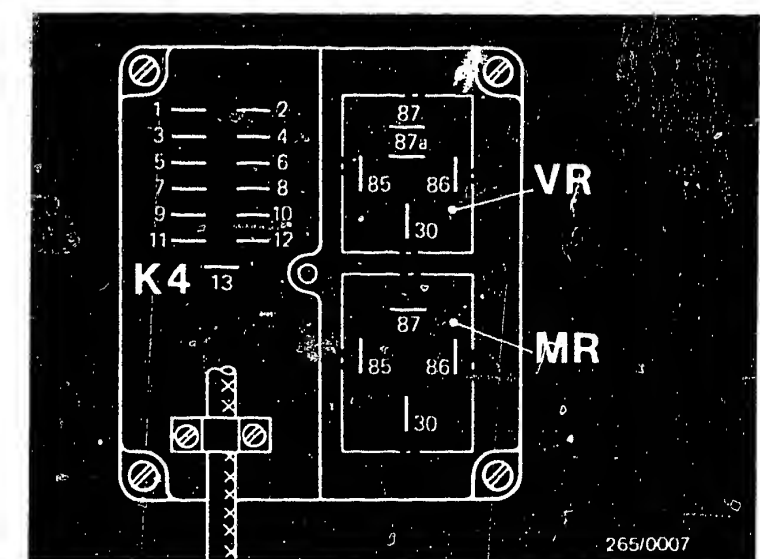
Continued on B 20



MR = Return-pump relay
VR = Valve relay

Top view of plug-in plate on hydraulic modulator

VR = Valve relay
MR = Return-pump relay
K4 = Wiring-harness plug



B 18

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi

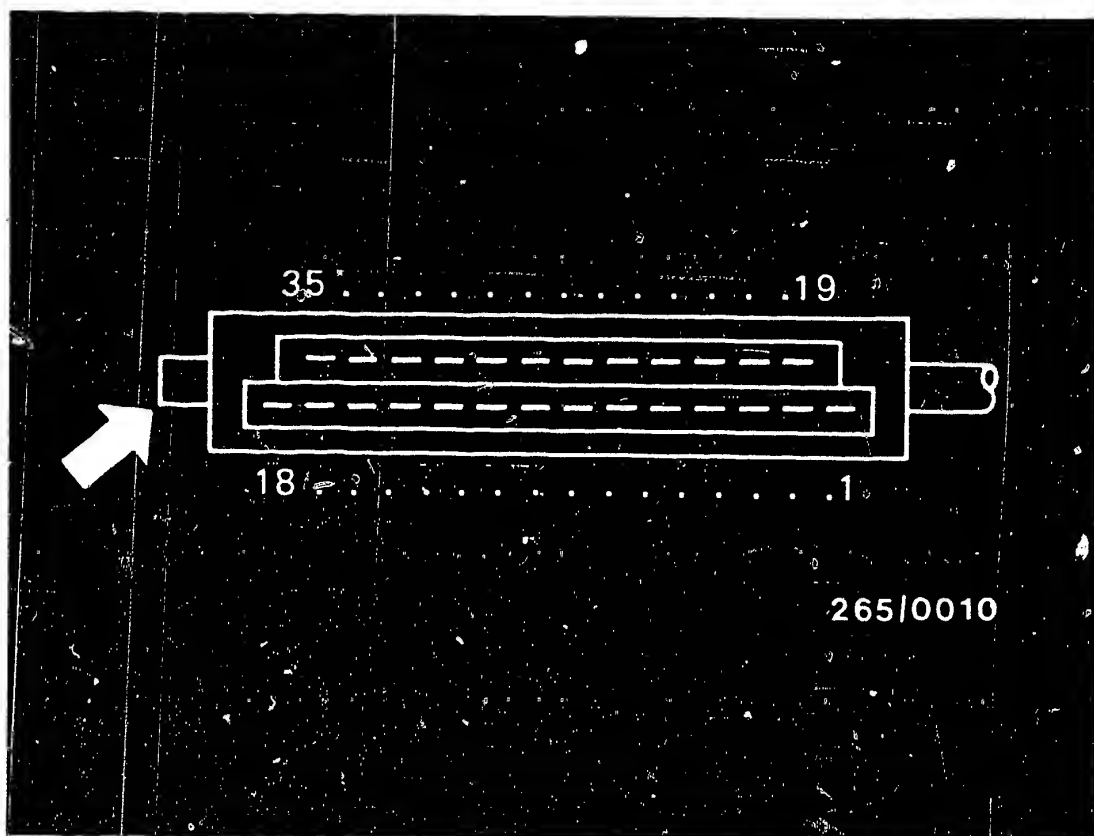


B 19

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi





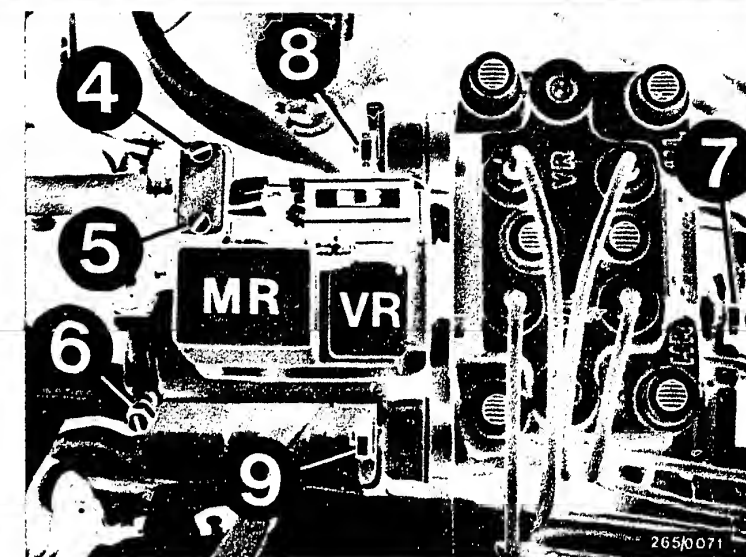
Trouble-shooting for TEST STEP 2 (continued)

Top view of multiple plug K 1 (35-pin) with terminal numbers.

Arrow = Lug with mechanical coding



TEST STEP 3		
Operation:		Reading:
Program selector switch position	2	Lamp 3 (green) must light up
Operation in vehicle: Switch on ignition.		If reading OK, continue testing with next test step.
		Testing:
		Component: Valve relay
		Operation: Relay make contact
		Malfunction: Lamp 4 (red) lights up



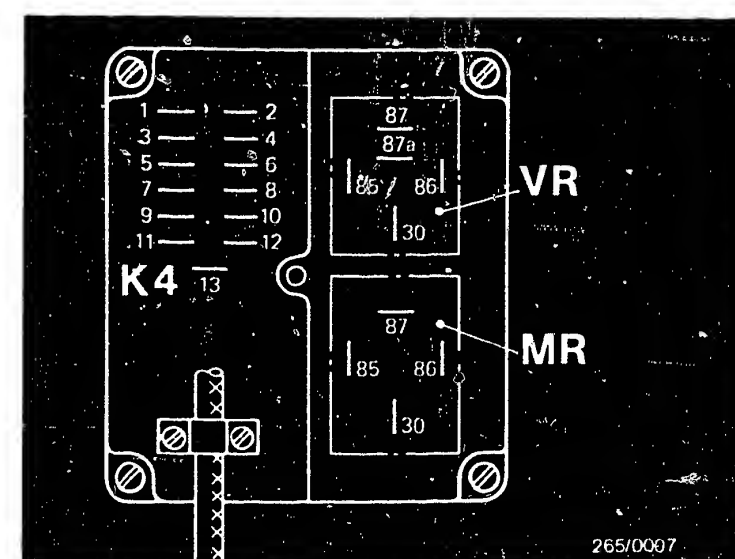
MR = Return pump relay
VR = Valve relay

Top view of plug-in plate on hydraulic modulator
VR = Valve relay
MR = Return-pump relay
K4 = Wiring-harness plug

Trouble-shooting (switch off ignition):

- Valve relay defective.
Caution! Use only relay with correct electrical terminal assignment.
- Test the following cables for continuity:
 - From term.B+ to plug K3/term.4
 - From K4/term.4 to valve relay term.87
 - From K3/term.6 to multiple plug K1/term.27
 - From K4/term.6 to valve relay term.85
 - From valve relay term.86 to return-pump relay term.86
 - From return-pump relay term.85 to K4/term.2
 - From K3/term.2 to driving switch term.15.

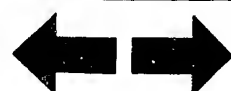
Continued on B 23



B21

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi

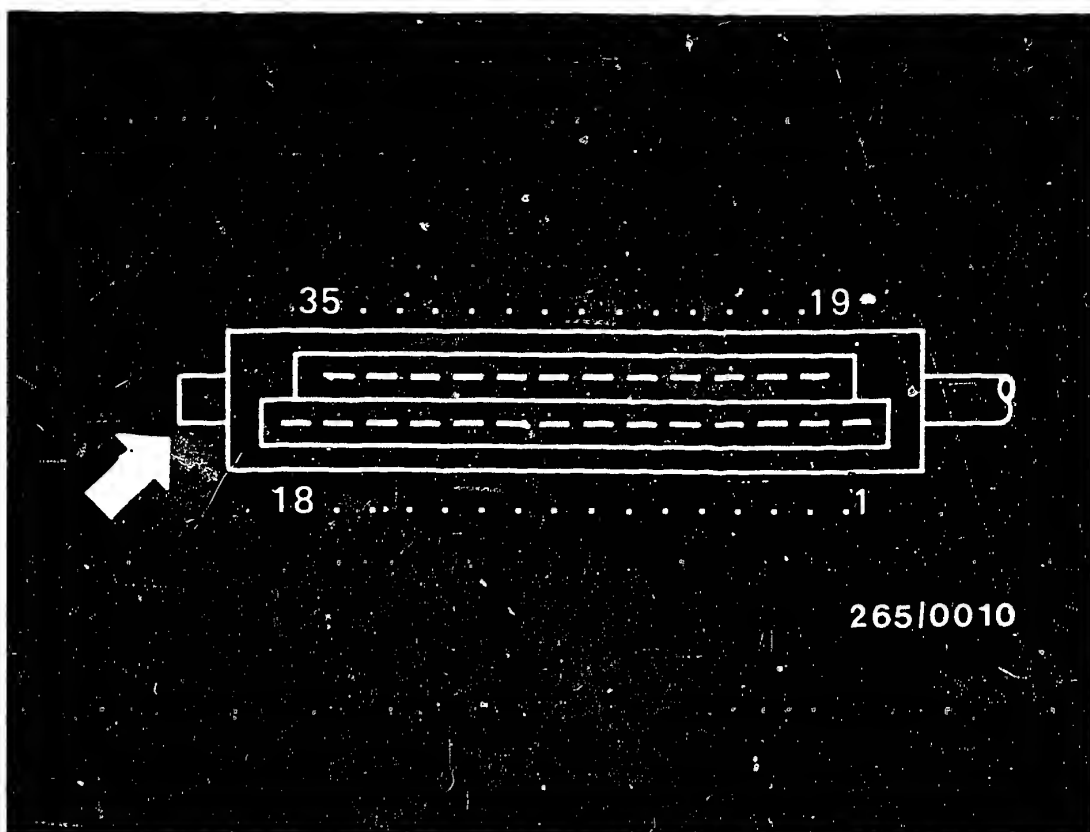


B22

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



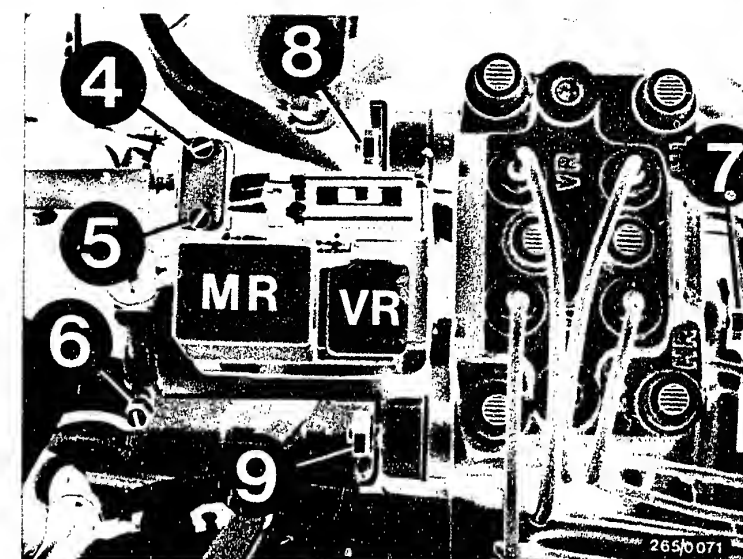


Trouble-shooting for TEST STEP 3 (continued)

Top view of multiple plug K 1 (35-pin) with terminal numbers.

Arrow = Lug with mechanical coding

TEST STEP 4		
Operation:		Reading:
Program-selector switch position	3	Lamp 3 (green) must light up.
Operation in vehicle: Switch on ignition.		If reading OK, continue testing with next test step.
		Testing:
		Component: Return-pump relay
		Operation: Off-position
		Malfunction: Lamp 4 (red) lights up



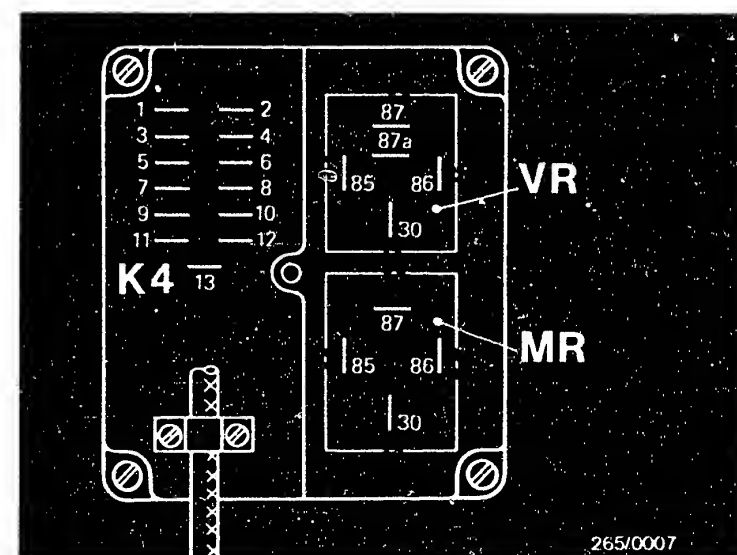
MR = Return pump relay
VR = Valve relay

Top view of plug-in plate on hydraulic modulator
VR = Valve relay
MR = Return-pump relay
K4 = Wiring-harness plug

Trouble-shooting (switch off ignition):

- Return-pump relay defective.
- Check ground terminals of pump motor for security and contact resistance.
- Test the following cables for continuity:
From multiple plug K1/term.14 to plug K3/term.9
From K4/term.9 to return-pump relay term.30 and to positive terminal of pump motor.
- Check positive terminal of pump motor for security. Check pump motor for continuity. If no continuity, continue testing with test step 5.

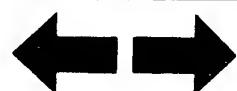
Continued on C 3



C1

Testing with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi

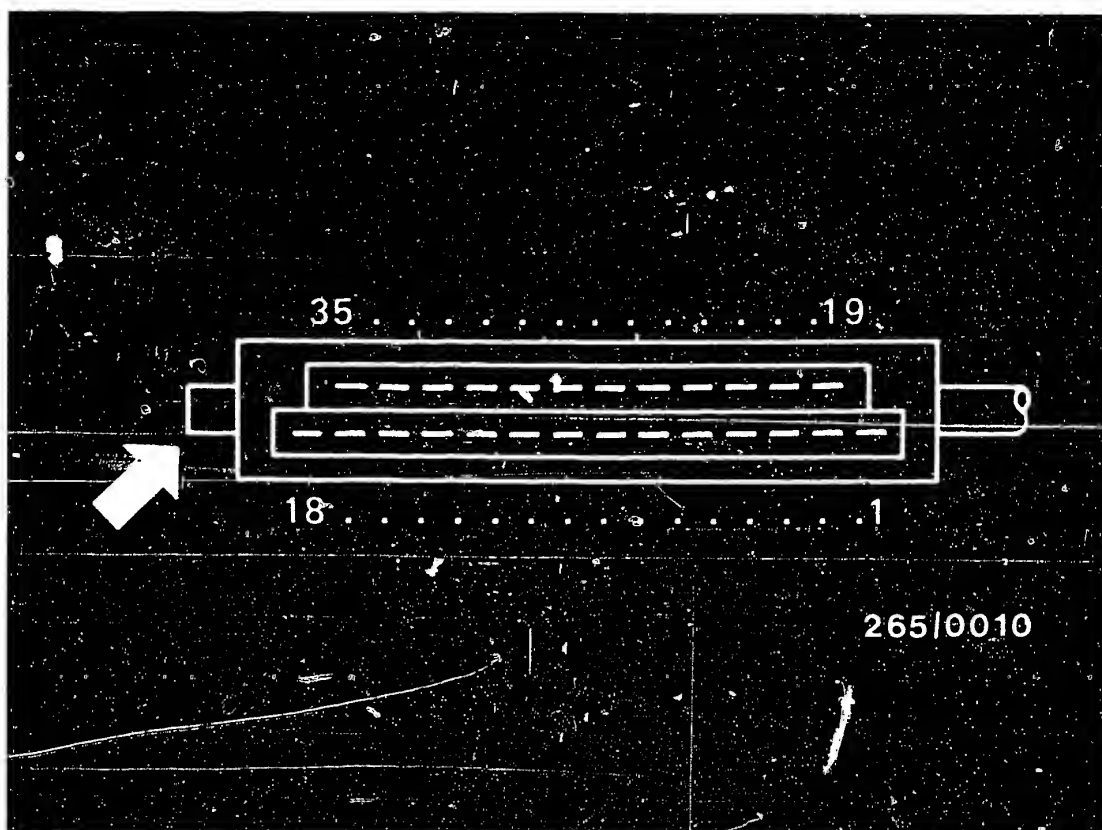


C2

Testing with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



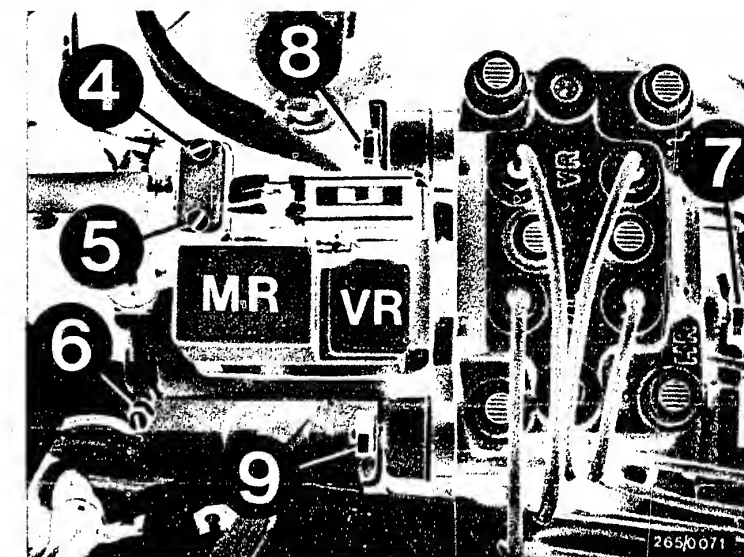


Trouble-shooting for TEST STEP 4 (continued)

Top view of multiple plug K 1 (35-pin) with terminal numbers.

Arrow = Lug with mechanical coding

TEST STEP 5			
Operation:		Reading:	Testing:
Program-selector switch position	4	Lamp 3 (green) must light up Pump motor can be heard to operate.	<u>Component:</u> Return-pump relay
Illuminated key lights up press key	●		<u>Operation:</u> Relay make contact
<u>Operation in vehicle:</u> Switch on ignition		If reading OK, continue testing with next test step.	<u>Malfunction:</u> Lamp 4 (red) lights up



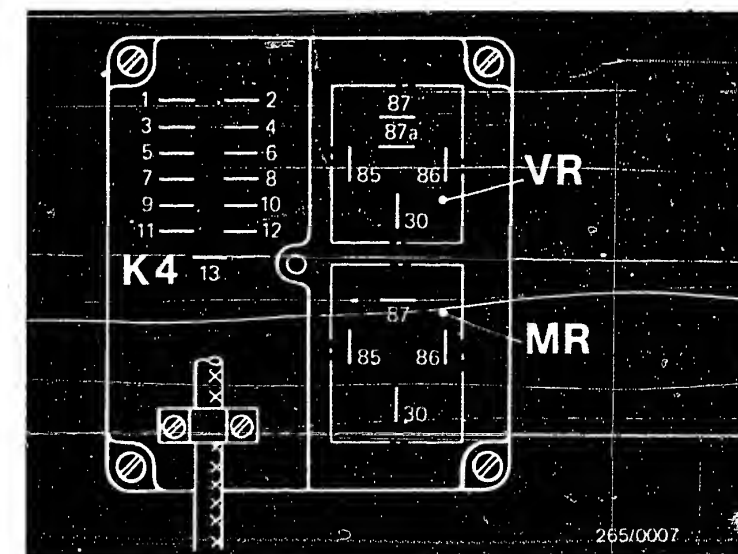
MR = Return pump relay
VR = Valve relay

Top view of plug-in plate on hydraulic modulator
VR = Valve relay
MR = Return-pump relay
K4 = Wiring-harness plug

Trouble-shooting (switch off ignition):

- Return-pump relay defective.
- Test the following cables for continuity:
From multiple plug term.85 to K4/term.11
From K3/term.11 to multiple plug K1/term.28
From return-pump relay term.87 to K4/term.13
From K3/term.13 to term.B+
- Pump motor not operating:
Continue testing with test step 6.

Continued on C 6



C4

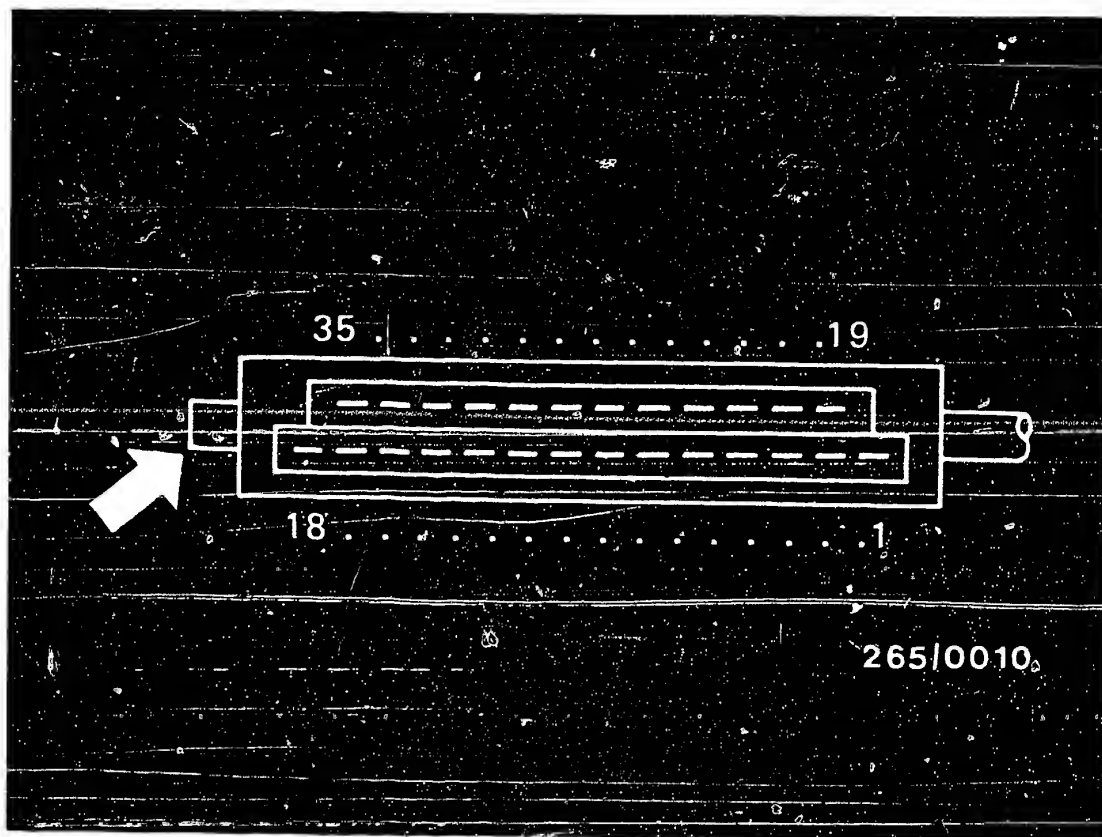
Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



C5

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi





Trouble-shooting for TEST STEP 5 (continued)

Top view of multiple plug K 1 (35-pin) with terminal numbers.

Arrow = Lug with mechanical coding.

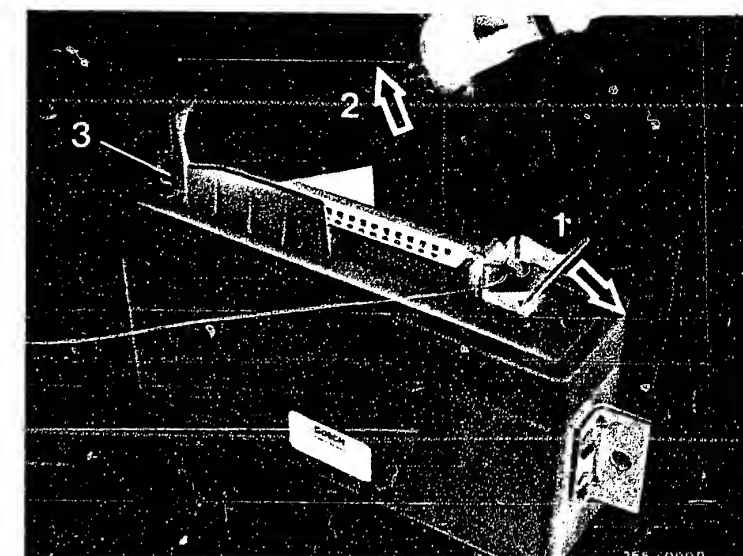
C6

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 6 Note: Disconnect overvoltage protection device from tester (back).			
Operation:		Reading:	Testing:
Program-selector switch position	5	Lamp 3 (green) must light up.	Component: Controller
Illuminated key lights up, press key	●		Operation: Overvoltage protection
Operation in vehicle: Switch on ignition		If reading OK, continue testing with next test step.	Malfunction: Lamp 4 (red) lights up



- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

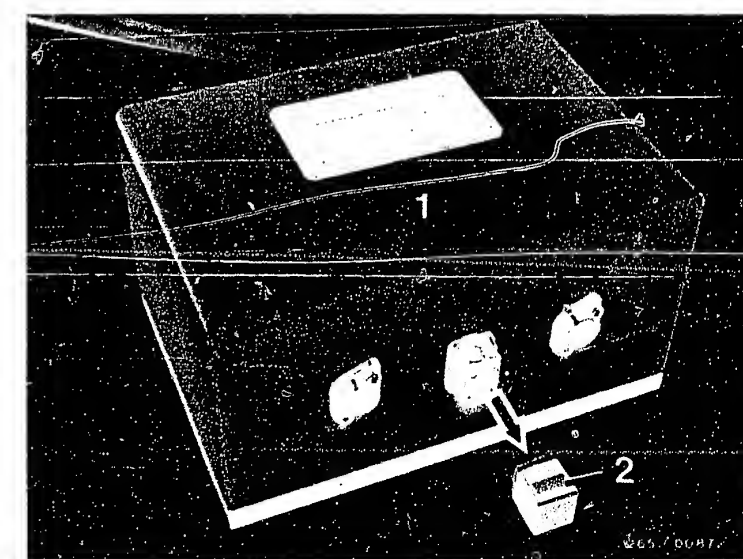
Trouble-shooting:

1. Repeat test step.
2. Replace controller (switching off ignition beforehand).

Notes:

- Switch off ignition before disconnecting multiple plug
- To disconnect multiple plug, push back spring, hinge up multiple plug and unhook from encoding block.
- Install only the specified controller.
- When installing, ensure that multiple plug locks into spring.
- Plug on cover.

- 1=ABS tester
2=Overvoltage protection



C7

Test with ABS tester

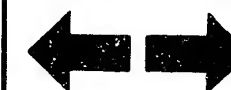
BMW 628 CSi, 633 CSi, 635 CSi



C8

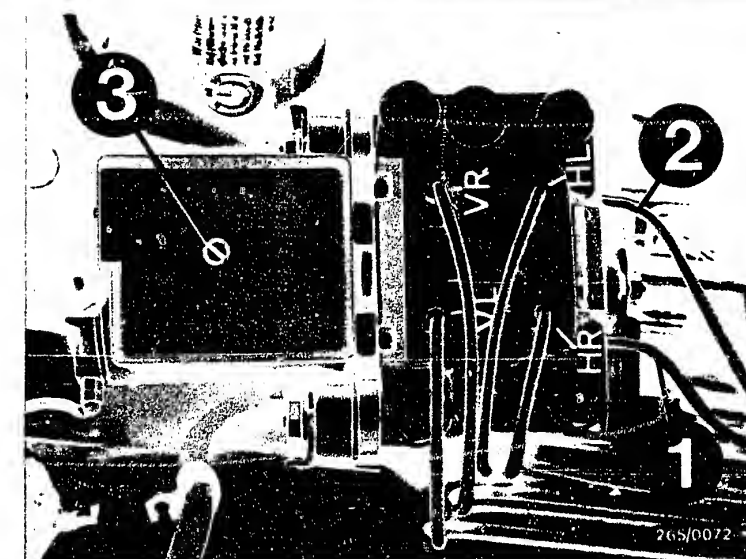
Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 7

Operation:		Reading:	Testing:
Program-selector switch position	6	Read off digital display unit each time after pressing a key. <u>0.7...1.7 Ω</u>	Component: Hydraulic modulator
1. Press key FL	●		Operation: Valve internal resistance FL
2. Press key FR	●		Valve internal resistance FR
3. Press key RL	●		Valve internal resistance RL
4. Press key RR	●		Valve internal resistance RR
Operation in vehicle: Switch on ignition.		If reading OK, continue testing with next test step.	Malfunction: Internal resistance less than 0.7 Ω or greater than 1.7 Ω



- 1 = Brake line to front brake master cylinder
- 2 = Brake line to rear brake master cylinder
- 3 = Screw for lid

Top view of plug-in plate on hydraulic modulator
Position of terminals
VR = Valve relay
MR = Return-pump relay
K4 = Wiring-harness plug

Trouble-shooting (switch off ignition):

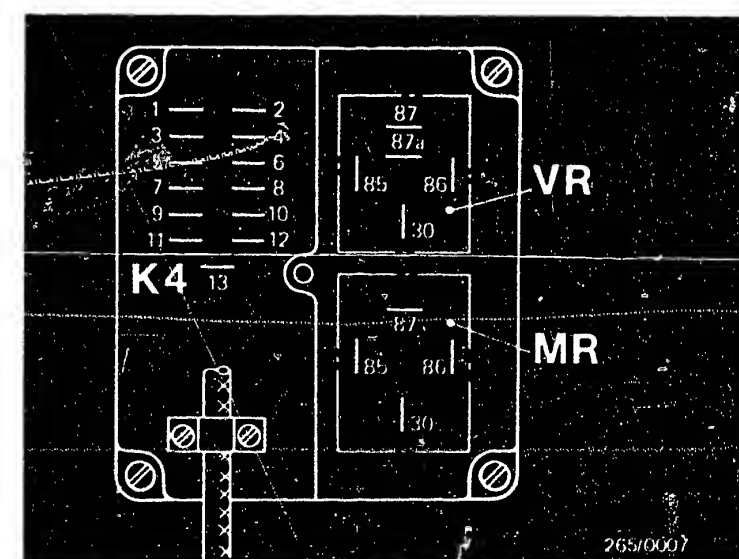
1. Measure internal resistance directly at hydraulic modulator:

Valve FL	between K4/term.1 and K4/term.12
Valve FR	between K4/term.3 and K4/term.12
Valve RL	between K4/term.5 and K4/term.12
Valve RR	between K4/term.7 and K4/term.12

Nominal value not reached:

Replace hydraulic modulator.

Continued on C 11/C 12



C9

Test with ABS tester

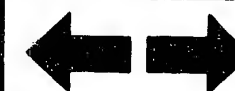
BMW 628 CSi, 633 CSi, 635 CSi



C10

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 7 (continued)

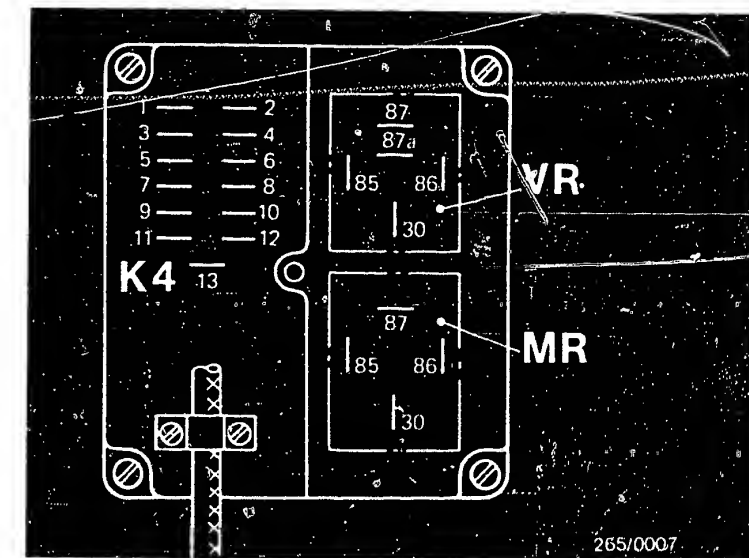
2. Test cables for continuity (set value 0 Ω):

Valve FL	between K3/term.1 and multiple plug K1/term.2
Valve FR	between K3/term.3 and multiple plug K1/term.35
Valve RL	between K3/term.5 and multiple plug K1/term.18
Valve RR	between K3/term.7 and multiple plug K1/term.19

If open circuit:

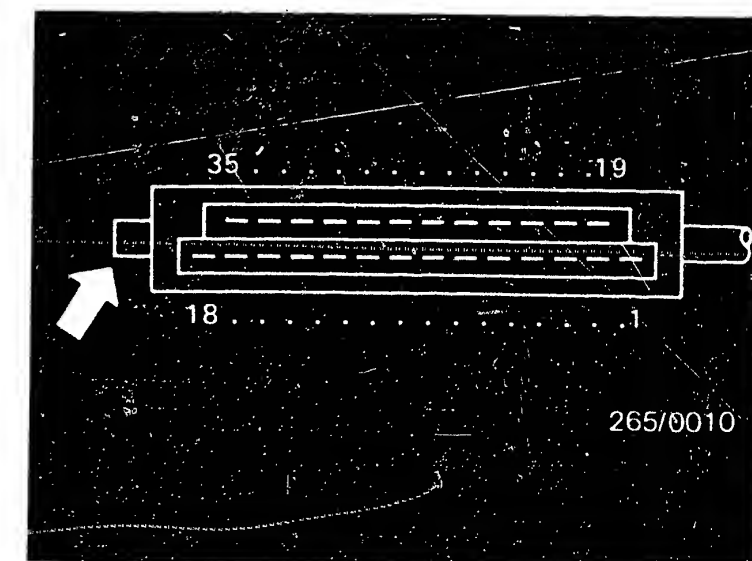
- Check plug-in connections
- Eliminate open circuit

Continued on C 13/C 14



Top view of plug-in plate on hydraulic modulator
Position of terminals
VR = Valve relay
MR = Return-pump relay
K4 = Wiring-harness plug

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical coding



C11

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



C12

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

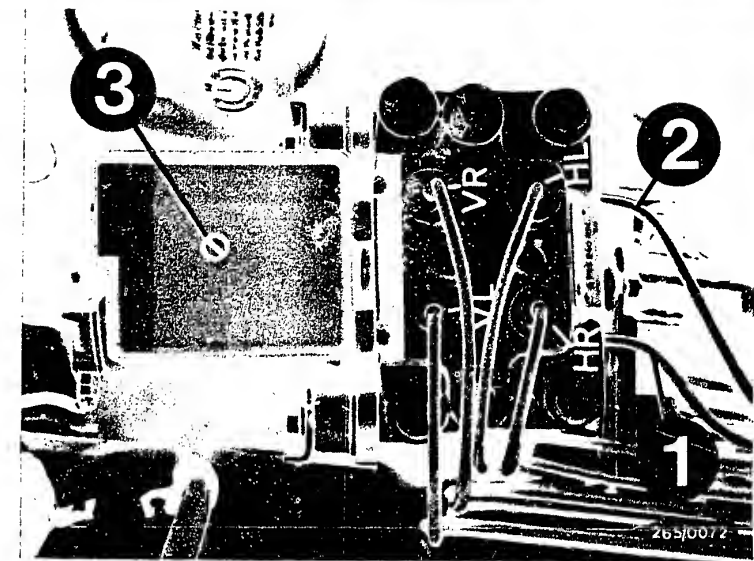


Trouble-shooting for TEST STEP 7 (continued)

Removing the hydraulic modulator

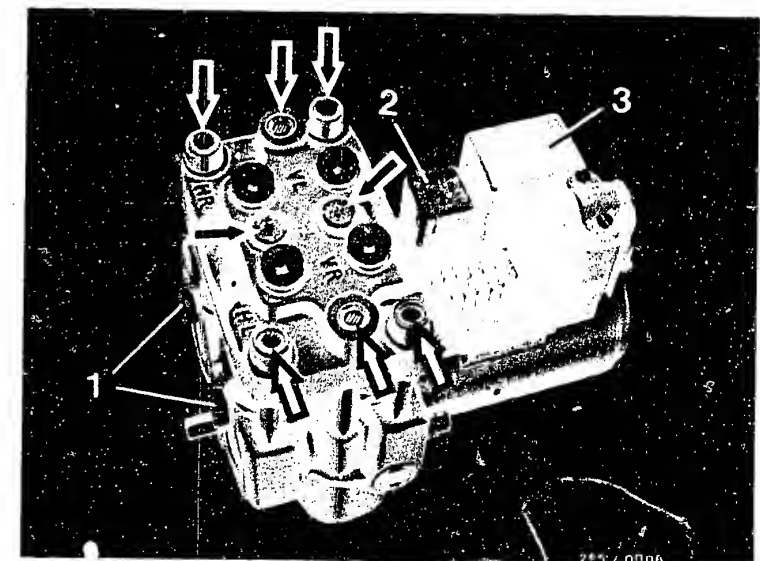
- For safety reasons, the hydraulic modulator must not be repaired, but the complete unit must be replaced.
Exceptions to this are the return-pump relay and the valve relay. Both relays may be replaced.
- Apart from the brake-line connections, it is not permissible to loosen any screws on the hydraulic modulator. In particular the hexagon-socket-head cap screws (bottom picture - arrows) may under no circumstances be loosened. After loosening, it is no longer possible to get the brake circuits leak-tight.
Danger!
- Check the hydraulic modulator and brake-line connections for leaks by means of a visual examination. If brake fluid is escaping, tighten the brake-line connections (12...16 Nm) or replace, or replace the hydraulic modulator.

Continued on C 15/C 16



- 1 = Brake line to front brake master cylinder
- 2 = Brake line to rear brake master cylinder
- 3 = Screw for lid

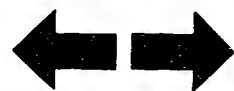
- 1 = Connection points for brake lines to brake master cylinder
- 2 = Valve relay
- 3 = Return-pump relay



C13

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



C14

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 7 (continued)

Pay particular attention to the joint identified by 3 arrows (top picture). On the base of the hydraulic modulator there is a vent hole to the pump pistons. A slight escape of brake fluid is possible at this point.

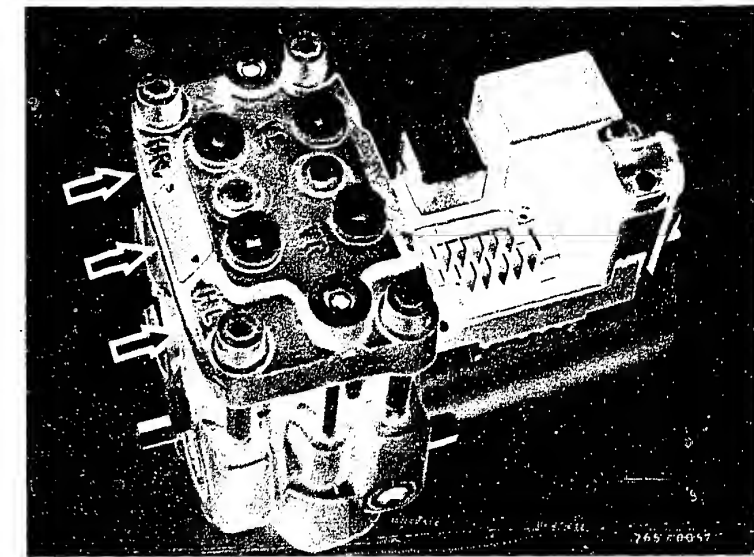
A complaint is only justified if, after pressing the brake pedal several times, a pool of brake fluid is formed under the hydraulic modulator.

- When removing and installing the brake lines, make sure that the lines are marked in accordance with the markings on the hydraulic modulator and that they are not mixed up when re-connecting (e.g. FL of hydraulic modulator must be connected to the front left wheel brake cylinder).

- Markings on hydraulic modulator

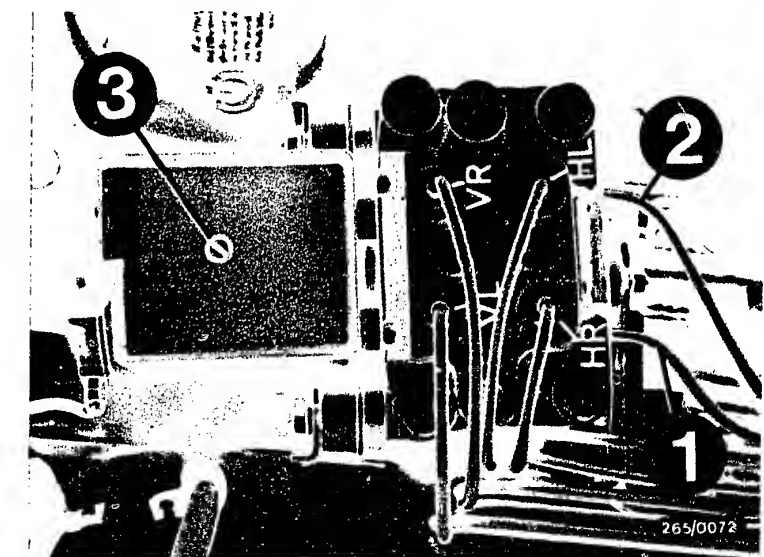
VL = Connection for brake line front left (wheel brake cylinder)
VR = Connection for brake line front right (wheel brake cylinder)
HR = Connection for brake line rear right (wheel brake cylinder)
HL = Connection for brake line rear left (wheel brake cylinder)

Continued on C 17/ C 18



Arrows = Joint

- 1 = Brake line to front brake master cylinder
2 = Brake line to rear brake master cylinder
3 = Screw for lid



C15

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi,



C16

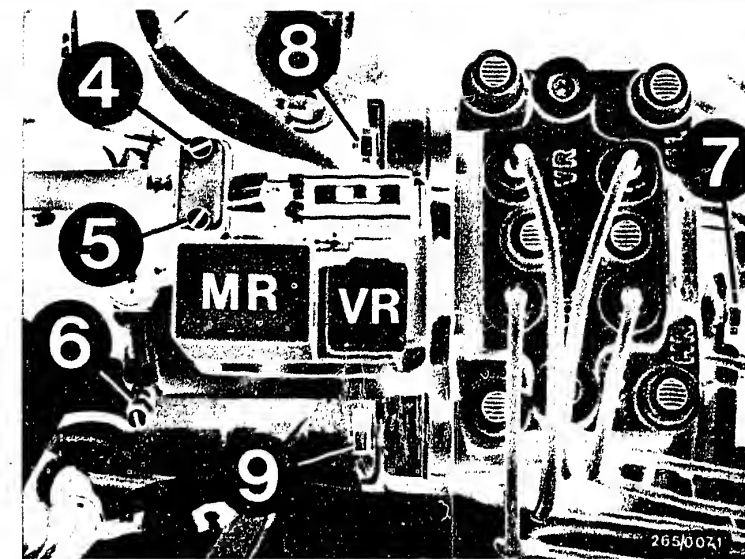
Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 7 (continued)

- Use only the specified double-end flare nut wrench 9x11 mm for loosening and tightening the brake lines.
- Mark brake lines and remove from hydraulic modulator.
- Catch the brake fluid and do not bring it into contact with your skin or clothing or with paintwork.
- Immediately seal the brake lines and connections with dummy plugs.
- Disconnect ground cable (6) from pump motor.
- Loosen fastening screw and remove cover.
- Loosen bracket (4, 5) and remove plug.
- Loosen hexagon nuts from holder (7,8,9) and remove hydraulic modulator.



Installation

- Mount hydraulic modulator in the holder and fasten with the hexagon nuts.
- Connect ground cable to pump motor. Plug on 13-pin plug and fasten with the bracket (4,5).
- Fasten cover on the hydraulic modulator with the screw.
- Connect the brake lines to the hydraulic modulator in accordance with the markings.
- Observe the tightening torque for the brake-line connections on the hydraulic modulator: 12...16 Nm.
- Bleed the brake system and check for leaks.
- Fully test the ABS with the tester.

4 and 5 = Screws for wiring harness strain relief
6 = Ground terminal for pump motor
7,8 and 9 = Fastening points for hydraulic modulator
MR = Return-pump relay
VR = Valve relay

C17

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



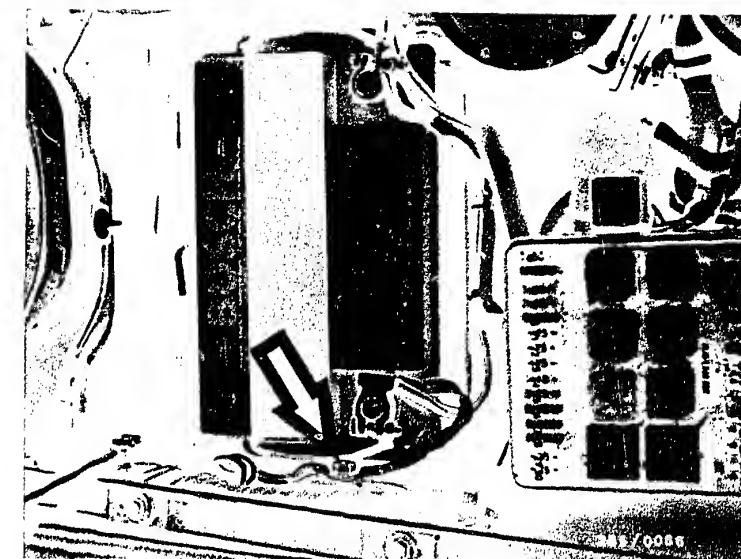
C18

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi

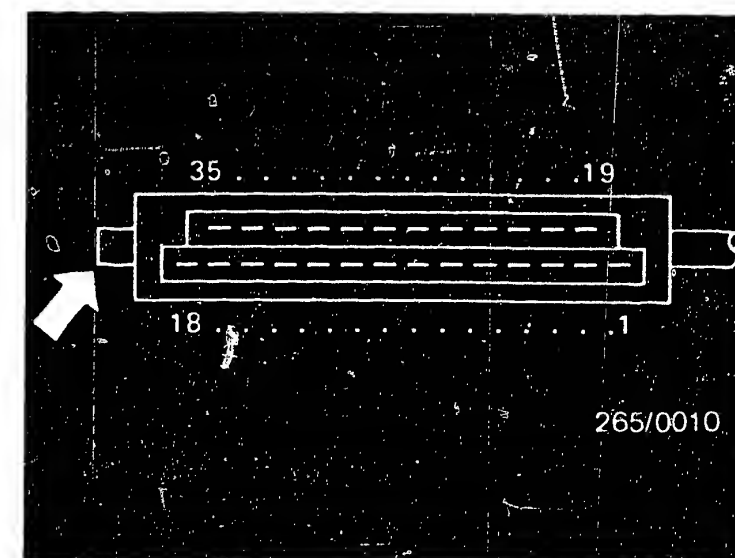


TEST STEP 8			
<u>Operation:</u>		<u>Reading:</u>	<u>Testing:</u>
Program-selector switch position	7	Digital display unit must indicate <u>30...300 mV.</u>	<u>Component:</u> Ground connection term.10
Illuminated key lights up, press key	●	If reading OK, continue testing with <u>next test step.</u>	<u>Operation:</u> Contact resistance
<u>Operation in vehicle:</u> Switch on ignition			<u>Malfunction:</u> Reading less than 30 mV or greater than 300 mV



Arrow=Ground terminal for pump motor and ABS

Top view of multiple plug K1 (35 pin) with terminal numbers
Arrow = Lug with mechanical coding



Trouble-shooting: (switch off ignition):

1. Reading less than 80 mV: Have the tester checked.
2. Reading greater than 300 mV: Check ground terminal for high contact resistance. Ground terminal must be bare down to the metal and must be securely tightened.

Test cables (10) for open circuit:
From ground to multiple plug K1/term.10.

C19

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

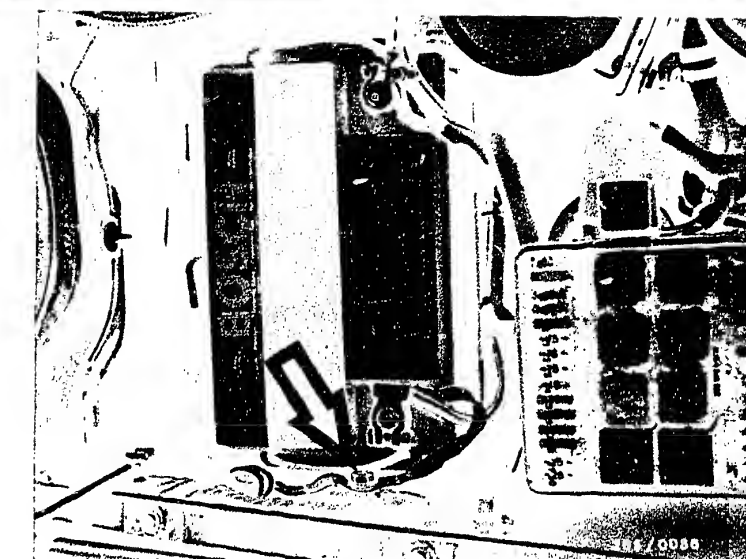


C20

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

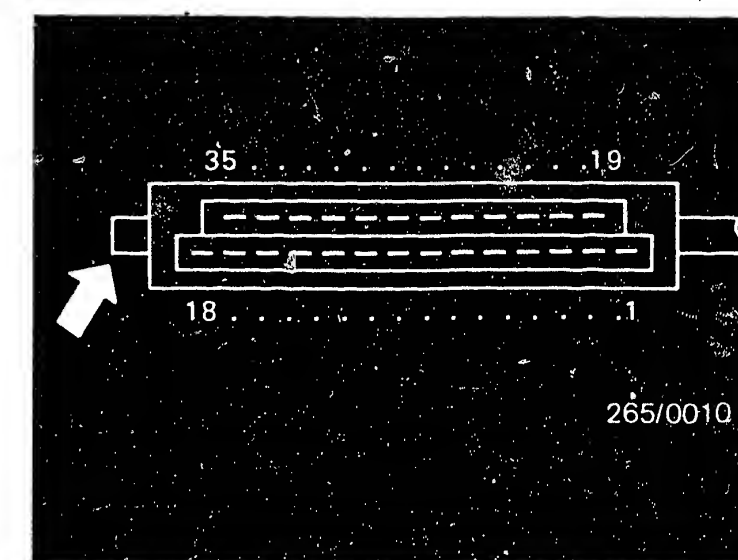


TEST STEP 9			
Operation:		Reading:	Testing:
Program-selector switch position	8	Digital display unit must indicate <u>30...250 mV.</u>	<u>Component:</u> Ground connection term.34
Illuminated key lights up, press key	●		<u>Operation:</u> Contact resistance
<u>Operation in vehicle:</u> Switch on ignition		If reading OK, continue testing with next test step.	<u>Malfunction:</u> Reading less than 30 mV or greater than 250 mV



Arrow=Ground terminal for pump motor and ABS

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical coding



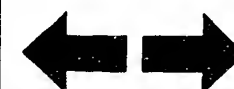
Trouble-shooting (switch off ignition):

1. Reading less than 30 mV: Have the tester checked.
2. Reading greater than 250 mV: Test ground terminal for high contact resistance and open circuit. Ground terminal must be bare down to the metal and must be securely tightened.

Test cable (34) for open circuit:
From ground to multiple plug K1/term.34

C21

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

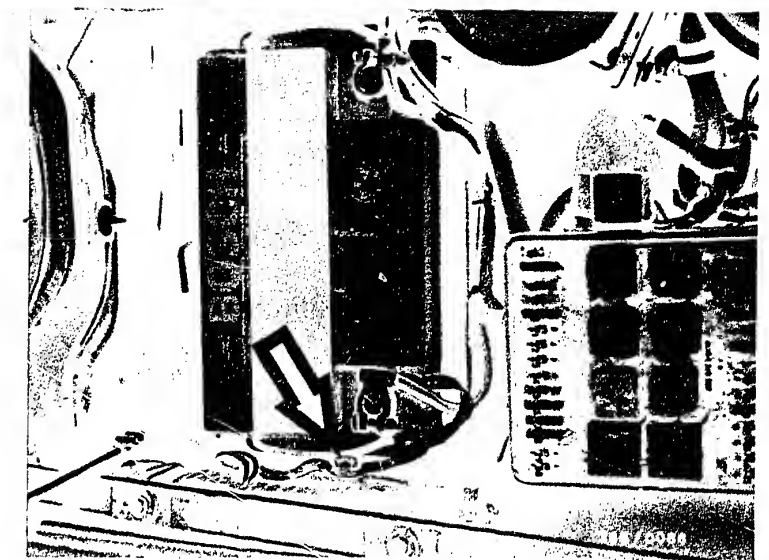


C22

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

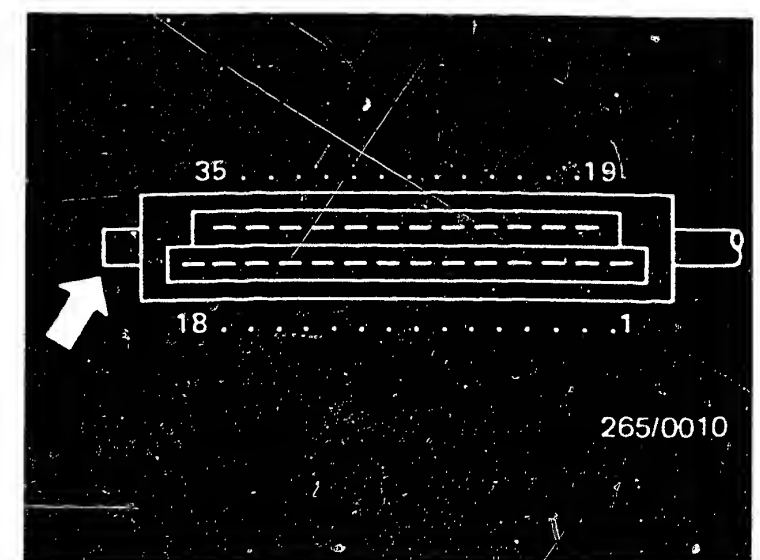


TEST STEP 10			
Operation:		Reading:	Testing:
Program-selector switch position	9	Digital display unit must indicate <u>30...250 mV.</u>	<u>Component:</u> Ground connection term. 20
Illuminated key lights up, press key	●		<u>Operation:</u> Contact resistance
<u>Operation in vehicle:</u> Switch on ignition		If reading OK, continue testing with next test step.	<u>Malfunction:</u> Reading less than 30 mV or greater than 250 mV



Arrow = Ground terminal for pump motor and ABS

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical coding



Trouble-shooting (switch off ignition):

1. Reading less than 30 mV: Have the tester checked.
2. Reading greater than 250 mV: Test ground terminal for high contact resistance and open circuit. Ground terminal must be bare down to the metal and must be securely tightened.

Test cable ②0 for open circuit:
From ground to multiple plug K1/term.20

C23

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



C24

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

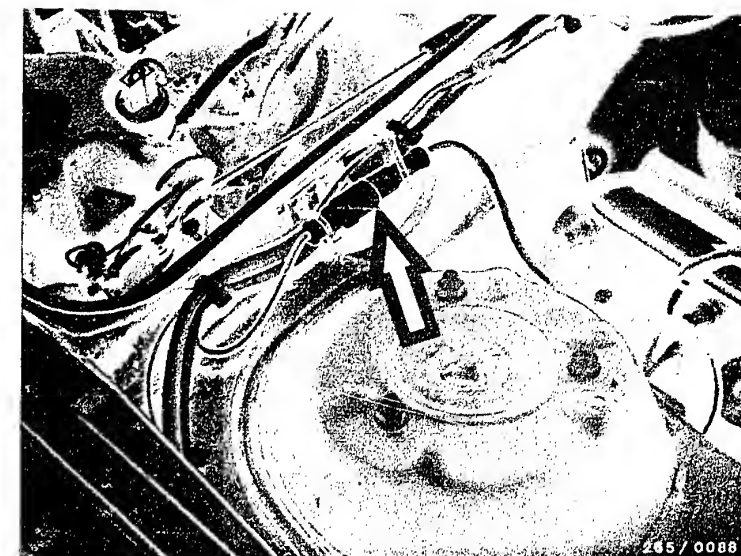


TEST STEP 11			
Operation:		Reading:	Testing:
Program-selector switch position	10	Digital display unit: for FL and FR: <u>0.8 ... 1.8 kΩ</u> ¹⁾	<u>Component:</u> Wheel-speed sensors front left and front right
Press keys FL and FR one after the other	●		<u>Operation:</u> Internal resistance
<u>Operation in vehicle:</u> Switch on ignition			<u>Malfunction:</u> Reading less than 0.8 k Ω or greater than 1.8 k Ω

1) Note:

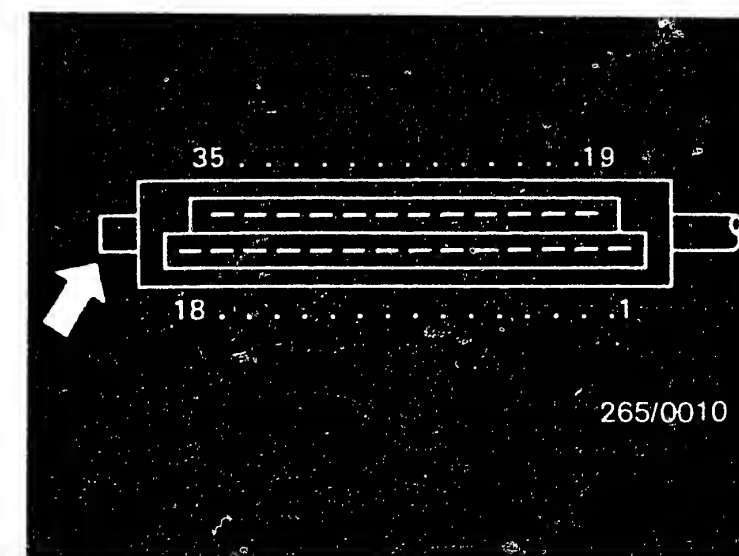
The customer complaint
"indicator lamp lighting up occasionally; after
renewed starting or actuation of the on/off switch
indicator lamp stays off"
may possibly be due to a loose contact in the wheel-
speed sensor cables or the 2-pin wheel-speed sensor
plug connectors. The problem is due to temporary open-
circuits or touching of wires, caused by vibrations
or changes in loading.

Locate the fault using the following test method.
Continued on D 3/D 4



Arrow = Wheel-speed sensor plug con-
nector in engine compartment

Top view of multiple plug K1 (35-pin)
with terminal numbers
Arrow = Lug with mechanical coding



D1

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



D2

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 11 (continued)

Method of testing for loose contacts on wheel-speed sensors:

- One after the other, select wheel-speed sensors by pressing the respective key.
- When a wheel-speed sensor has been selected, move, bend and pull the appropriate cable directly at the wheel-speed sensor and at the fastening points, and do the same to the 2-pin plug connector.
- At the same time watch the digital display on the tester:
If the digital display changes sharply there is a loose contact. If there is an open circuit the display rises (max. 999); if there is a short circuit (usually at the wiring-harness plug) the reading falls (min. 000).
- Replace wheel-speed sensor.

Testing the wheel-speed sensor plug connectors:

- If the wheel-speed sensor cables are OK, the 2-pin plug connectors of the wheel-speed sensors on the wiring harness side must be tested in the same manner for loose contacts.
- If there is a loose contact at a 2-pin plug connector (wiring harness side) it must be repaired with the repair kit.
So as not to have to replace the complete wiring harness, BMW offers a repair kit for repairing the plug connector (wiring-harness side). (It is also possible to use the corresponding repair kit from Audi).

The repair kit consists of a connector with the insulation stripped off the cable end, and shrinkable insulating tubing.

If necessary, the repair kits are to be obtained from VAG or BMW dealers.

Repairing the plug connectors

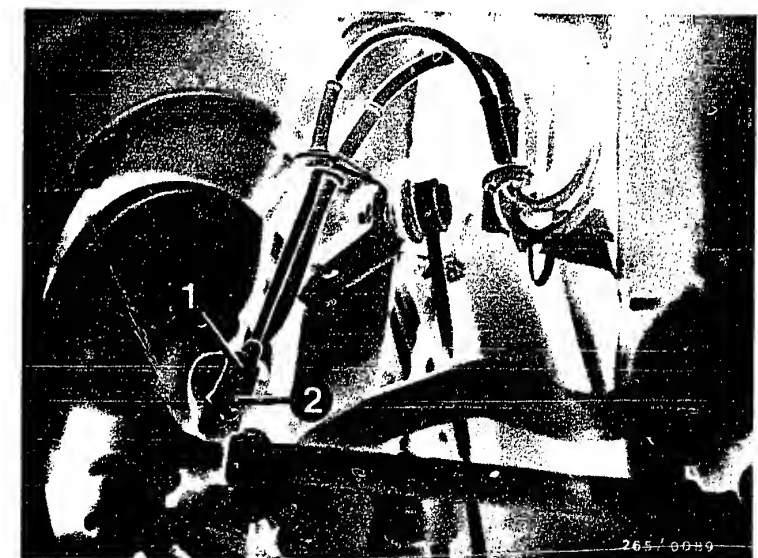
- Disconnect battery.
- Undo wheel-speed sensor plug connectors for front wheels in engine compartment 25 mm after the wiring-harness plug.

Continued on D 5/D 6



Arrow = Wheel-speed sensor plug connector in engine compartment

- 1 = Wheel-speed sensor
- 2 = Hexagon-socket-head cap screw



D3

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



D4

Test with ABS tester

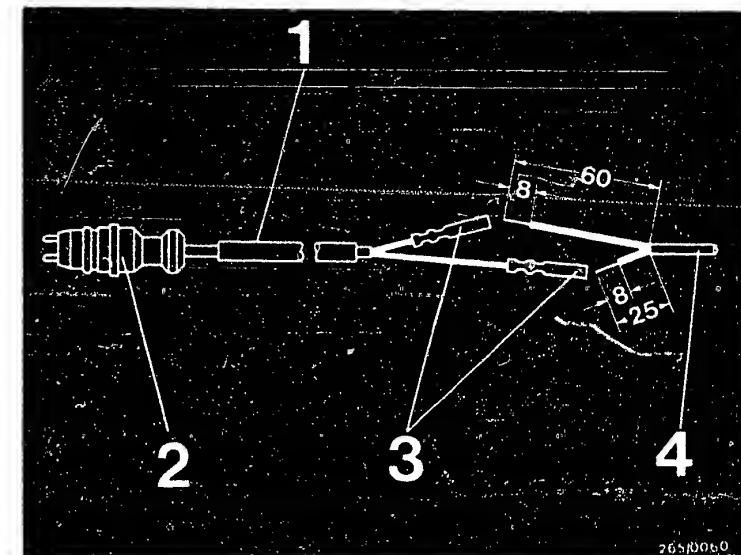
BMW 628 CSi, 633 CSi, 635 CSi



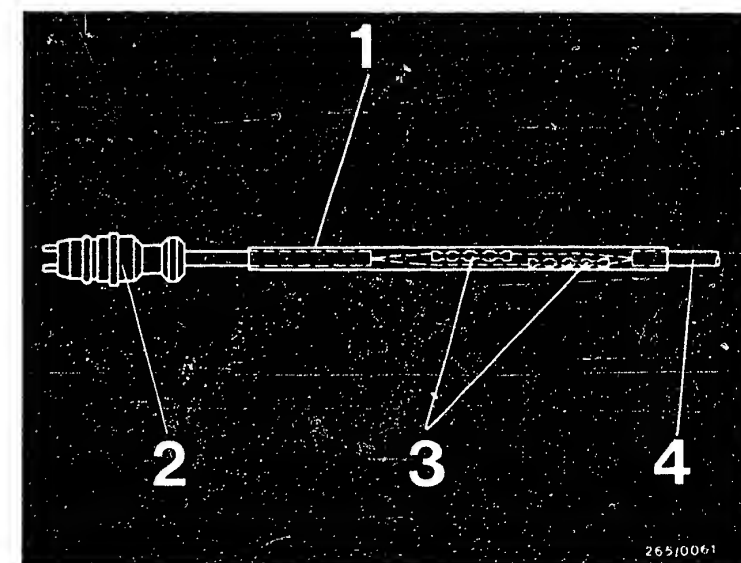
Trouble-shooting for TEST STEP 11 (continued)

- Carefully remove the outer black insulation over a length of 60 mm. Under no circumstances may the insulation of the two inner wires be damaged.
- Shorten a cable to 25 mm and strip off the insulation at both ends over approx. 8 mm (sketch).
- Using Eisemann crimping tool, carefully crimp on new wheel-speed sensor plug connectors to prevent renewed complaints.
- Slip shrinkable hose over the crimped connection and heat with a hairdryer. Temperature must be at least 125°C since the shrinkable hose is coated on the inside with a thermo-adhesive.
Perform the work carefully so that the repair is moisture-proof.

Continued on D 7/D 8.



- 1 = Shrinkable hose
- 2 = Repair connector
- 3 = Crimp-on terminals
- 4 = ABS wiring harness



D5

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



D6

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 11 (continued)

Trouble-shooting (switch off ignition)

1. Measure internal resistance at detached connectors.
If normal value not reached: replace wheel-speed sensor.

2. Test leads (4), (6), (21) and (23) for continuity.

From plug K 11 to multiple plug K1/term.6 and term.4
From plug K 13 to multiple plug K1/term.23 and term.21.

3. Check plug connectors.

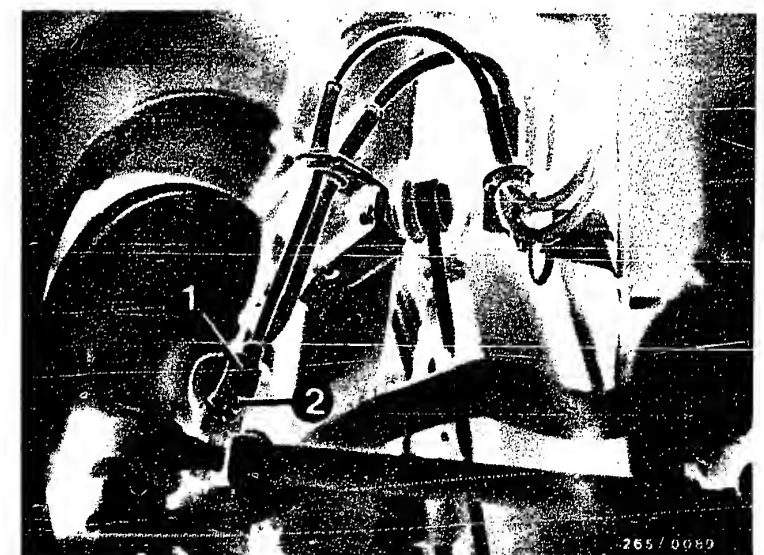
Removing wheel-speed sensors on front axle

- Undo plug connector (top picture - arrow) in engine compartment.
- Installation positions of plug connectors:
In engine compartment on left and right on firewall.
- Undo plug connector.
- Loosen fasteners of cable.
- Loosen fastening screw (2) and pull out wheel-speed sensor. Do not use force.



Arrow = Wheel-speed sensor plug
connector in engine
compartment

1 = Wheel-speed sensor
2 = Hexagon-socket-head cap screw



Continued on D 9/D 10

D7

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



D8

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 11 (continued)

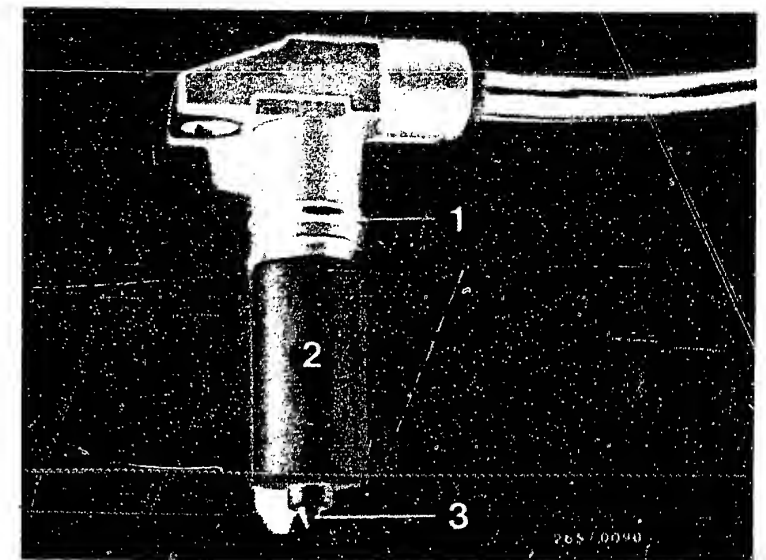
Installing wheel-speed sensors on front axle

- Check O-ring and rubber sleeve for cracks. Replace if necessary.
- Grease wheel-speed-sensor housing with Molykote Longterm 2.

Caution!

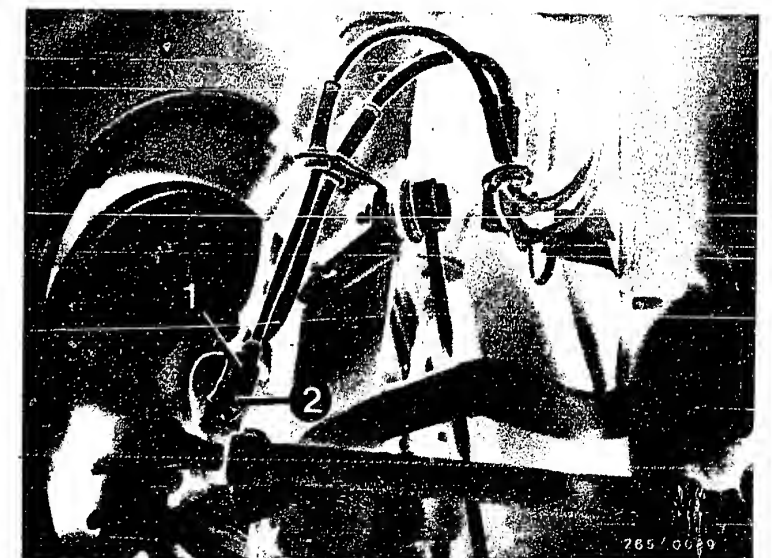
Before installing the wheel-speed sensors, make sure that there are no metallic foreign bodies on the permanently magnetic edges.

- Press wheel-speed sensor into mounting hole. Do not hit. Do not damage O-ring.
- Secure wheel-speed sensor with hexagon-socket-head cap screw.
- Pull cable up into engine compartment and connect to ABS wiring harness by means of the 2-pin plug connector.
- Resecure wheel-speed sensor cable.
- Fully test the ABS with the tester.



- 1 = O-ring
- 2 = Housing
- 3 = Wheel-speed sensor edge

- 1 = Wheel-speed sensor
- 2 = Hexagon-socket-head cap screw



D9

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



D10

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 12			
Operation:		Reading:	Testing:
Program-selector switch position	10	Digital display unit must indicate $0.6 \dots 1.6 \text{ k}\Omega$ ¹⁾	<u>Component:</u> Wheel-speed sensors rear left and rear right <u>Operation:</u> Internal resistance <u>Malfunction:</u> Reading less than $0.6 \text{ k}\Omega$ or greater than $1.6 \text{ k}\Omega$
Press keys RL and RR one after the other.	●	If reading OK, continue testing with next test step.	
<u>Operation in vehicle:</u> Switch on ignition			

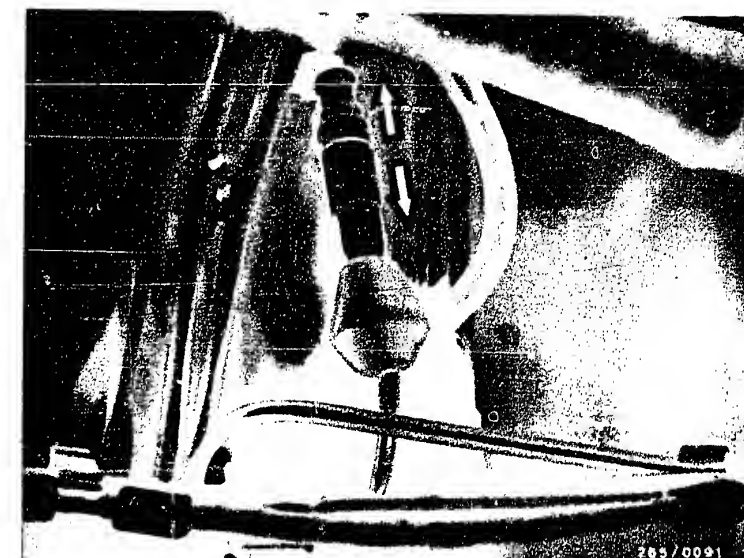
1)

Note:

The customer complaint "indicator lamp lighting up occasionally; after renewed starting or actuation of the on/off switch indicator lamp stays off" may possibly be due to a loose contact in the wheel-speed sensor cables or the 2-pin wheel-speed sensor plug connectors. The problem is due to temporary open-circuits or touching of wires, caused by vibrations or changes in loading.

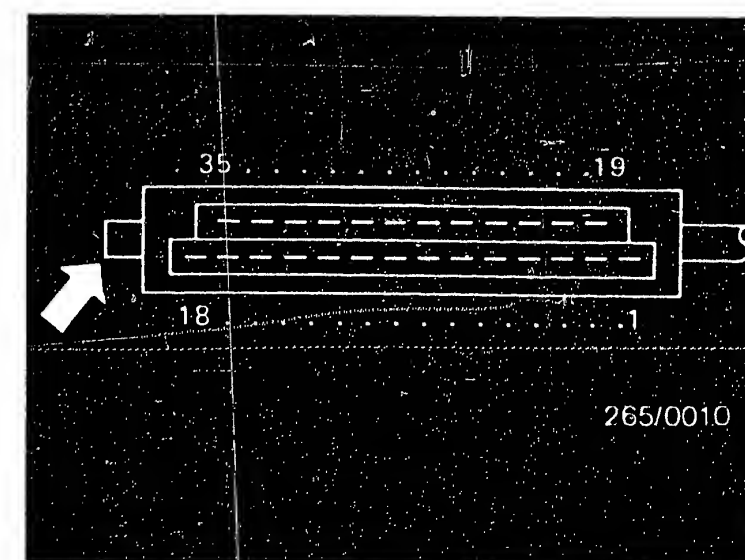
Locate the fault using the following test method.

Continúa en D 13/D 14



Arrow=Wheel-speed sensor plug connector

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow=Lug with mechanical coding



265/0010

D11

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



D12

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 12 (continued)

Method of testing for loose contacts on wheel-speed sensors:

- One after the other, select wheel-speed sensors by pressing the respective key.
- When a wheel-speed sensor has been selected, move, bend and pull the appropriate cable directly at the wheel-speed sensor and at the fastening points, and do the same to the 2-pin plug connector.
- At the same time watch the digital display on the tester:
If the digital display changes sharply there is a loose contact. If there is an open circuit the display rises (max. 999); if there is a short circuit (usually at the wiring-harness plug) the reading falls (min. 000).
- Replace wheel-speed sensor.

Testing the wheel-speed sensor plug connectors:

- If the wheel-speed sensor cables are OK, the 2-pin plug connectors of the wheel-speed sensors on the wiring harness side must be tested in the same manner for loose contacts.
- If there is a loose contact at a 2-pin plug connector (wiring harness side) it must be repaired with the repair kit.
So as not to have to replace the complete wiring harness, BMW offers a repair kit for repairing the plug connector (wiring-harness side). (It is also possible to use the corresponding repair kit from Audi).

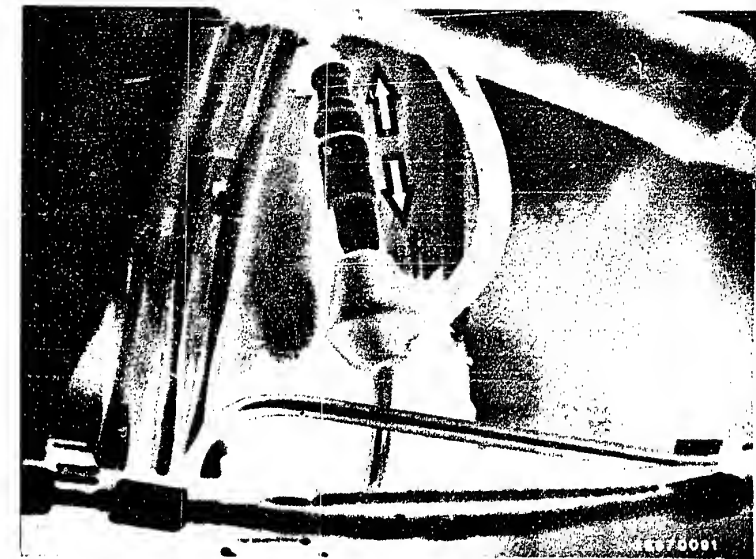
The repair kit consists of a connector with the insulation stripped off the cable end, and shrinkable insulating tubing.

If necessary, the repair kits are to be obtained from VAG or BMW dealers.

Repairing the plug connectors

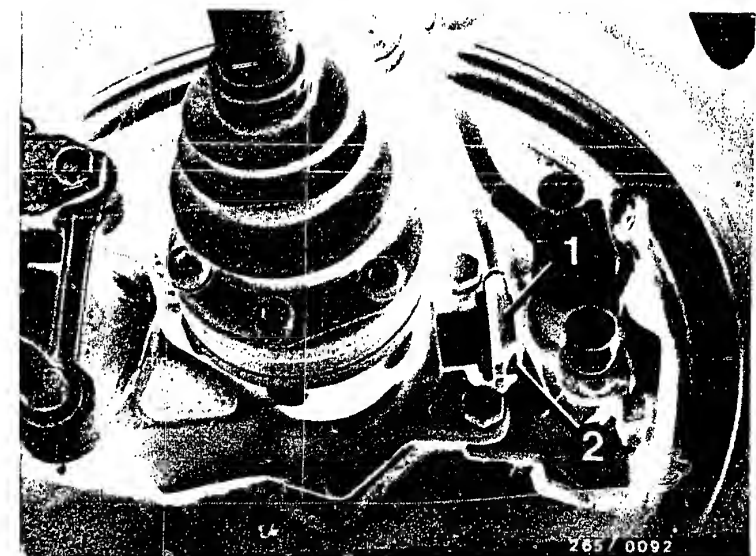
- Disconnect battery.
- Undo wheel-speed sensor plug connectors for rear wheels under rear seat bench 150 mm after wiring-harness plug.

Continued on D 15/D 16



Arrow = Wheel-speed sensor plug connector

- 1 = Wheel-speed sensor
- 2 = Hexagon-socket-head cap screw



D13

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



D14

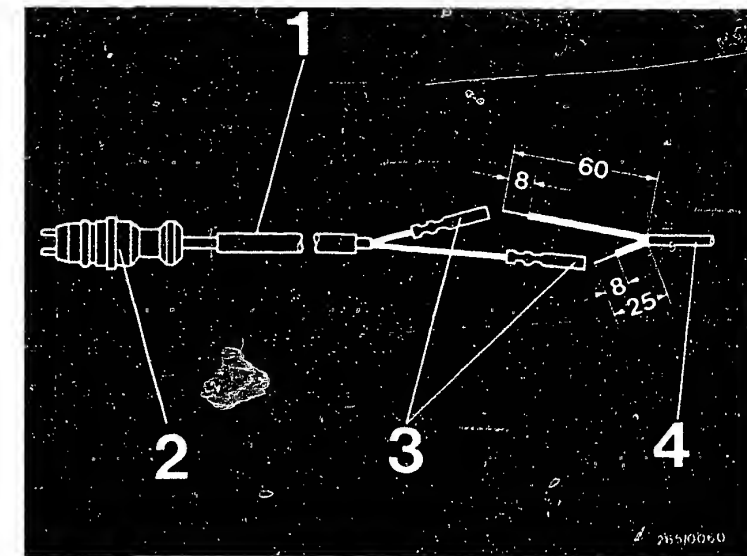
Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



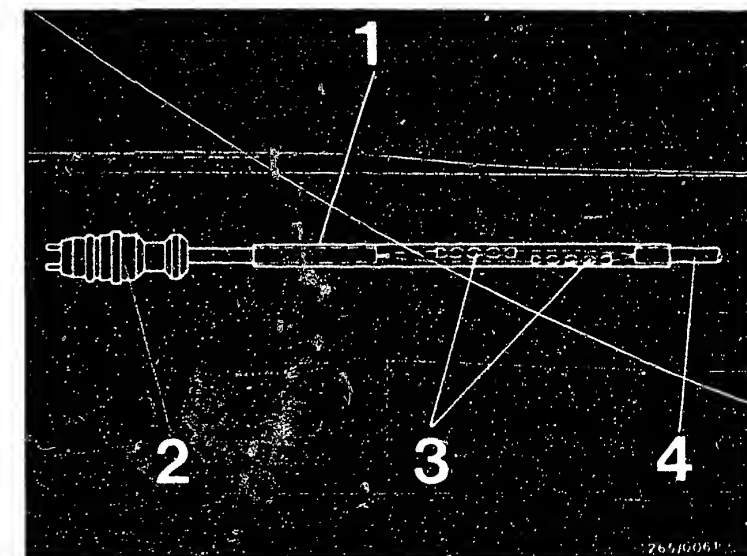
Trouble-shooting for TEST STEP 12 (continued)

- Carefully remove the outer black insulation over a length of 60 mm. Under no circumstances may the insulation of the two inner wires be damaged.
 - Shorten a cable to 25 mm and strip off the insulation at both ends over approx. 8 mm (sketch).
 - Using Eisemann crimping tool, carefully crimp on new wheel-speed sensor plug connectors to prevent renewed complaints.
 - Slip shrinkable hose over the crimped connection and heat with a hairdryer. Temperature must be at least 125°C since the shrinkable hose is coated on the inside with a thermo-adhesive.
- Perform the work carefully so that the repair is moisture-proof.



- 1 = Shrinkable hose
- 2 = Repair connector
- 3 = Crimp terminals
- 4 = ABS wiring harness

Continued on D 17/D 18



D 15

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



D 16

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 12 (continued)

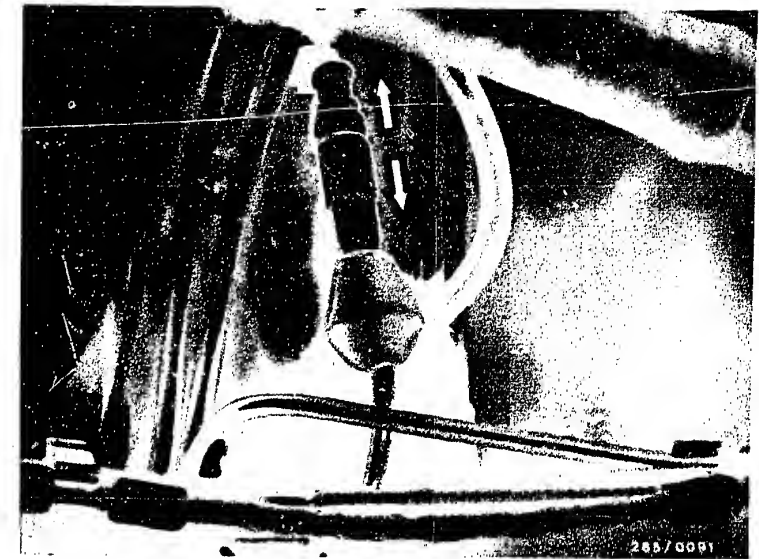
Trouble-shooting (switch off ignition)

1. Measure internal resistance at detached connectors. If nominal value not reached: replace corresponding wheel-speed sensor.
2. Test cables ⑦, ⑨, ②④ and ②⑥ for continuity:
From plug K 15 to multiple plug K1/term.7 and term.9.
From plug K 17 to multiple plug K1/term.24 and term.26.
3. Check plug connector.

Removing wheel-speed sensors on rear axle

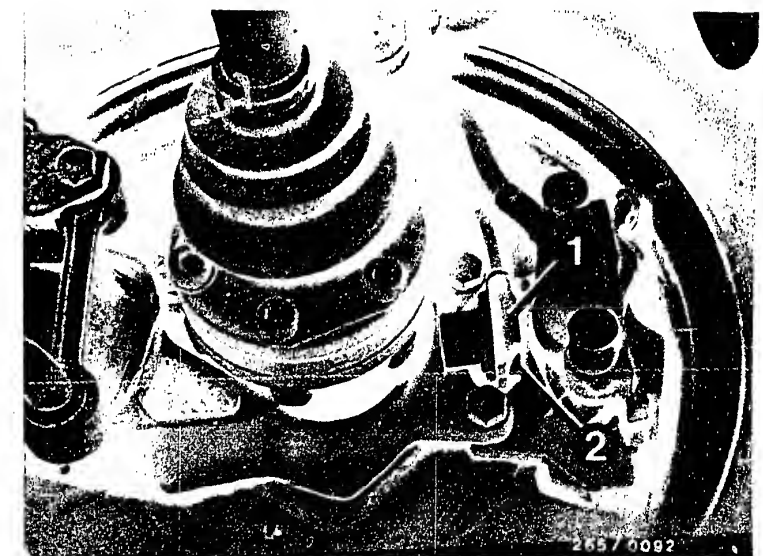
- Rear wheels can be removed to facilitate replacement of the wheel-speed sensors.
- Switch off ignition.
- Remove wheel-speed sensor cable from clamps.
- Pull out rubber sleeve and cable until plug connector can be reached.
Do not damage rubber sleeve. Undo plug connector.
- Unscrew brake caliper so that wheel-speed sensor can be pulled out.
Brake line remains connected.
- Loosen hexagon-socket-head cap screw (2) and pull out wheel-speed sensor (1).
Do not use force.

Continued on D 19/D 20



Arrow = Wheel-speed sensor plug connector

- 1 = Wheel-speed sensor
2 = Hexagon-socket-head cap screw



D17

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



D18

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 12 (continued)

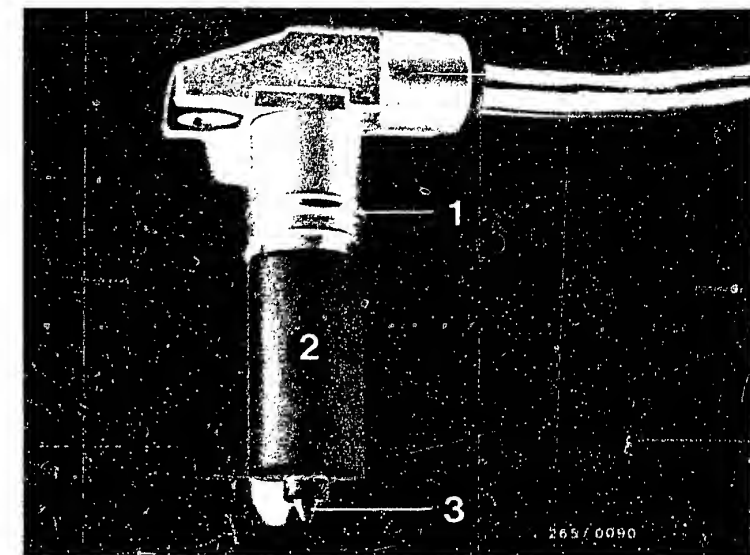
Install wheel-speed sensor on rear axle

- Test O-ring (1) for cracks and replace if necessary.
- Grease wheel-speed sensor housing with Molykote Longterm 2.

Caution!

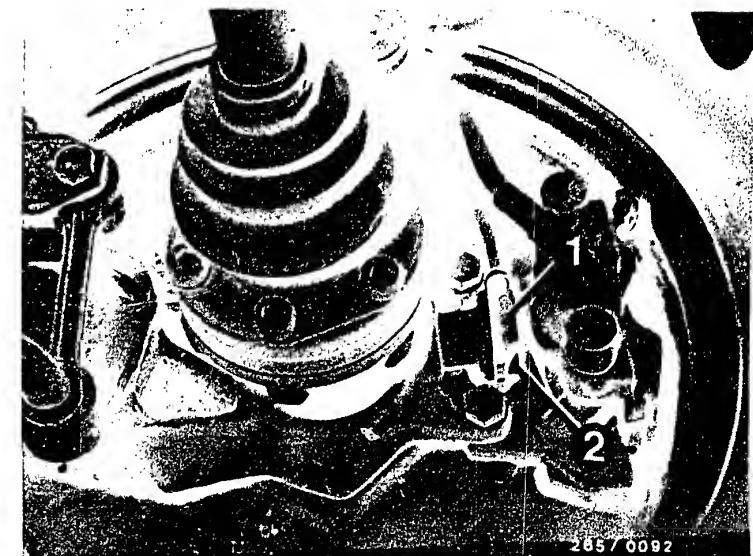
Before installing the wheel-speed sensors, make sure that there are no metallic foreign bodies on the permanently magnetic edges.

- Press wheel-speed sensor into mounting hole. Do not hit. Do not damage O-ring.
- Secure wheel-speed sensor with hexagon-socket-head cap screw.
- Connect wheel-speed sensor to wiring harness and fit plug connector with rubber sleeve into bore.
- Press cable into clamps.
- Screw on brake caliper and mount rear wheel.
- Fully test ABS with tester.



1=O-ring
2=Housing
3=Wheel-speed sensor edge

1=Wheel-speed sensor
2=Hexagon-socket-head
cap screw



D 19

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



D 20

Test with ABS tester

BMW 638 CSi, 633 CSi, 635 CSi



TEST STEP 13			
Operation:		Reading:	Testing:
Program-selector switch position	11	Digital display unit: for FL and FR: <u>20 ... 999 k Ω</u>	<u>Component:</u> Wheel-speed sensors front left and front right
Press keys FL and FR one after the other	●		<u>Operation:</u> Insulation resistance
<u>Operation in vehicle:</u> Switch on ignition			<u>Malfunction:</u> Reading less than 20 k Ω

Trouble-shooting (switch off ignition):

Plug connectors OK?

Undo plug connectors and bridge the plug leading to the tester using wire.

Repeat test:

If reading now OK, replace wheel-speed sensor.

If reading still below the nominal value, the cables from multiple plug term.6 and term.4 or term.23 and term.21 to the respective plug are defective.

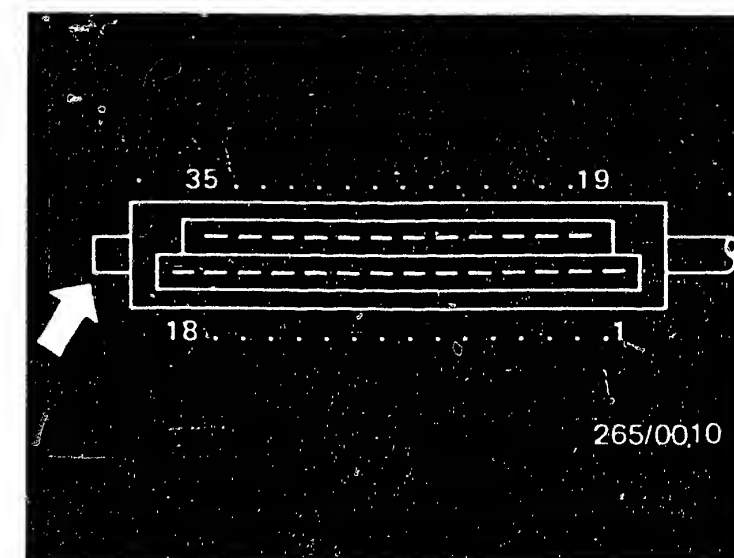
Check all cables for wear and short circuit to ground.

Continued on D 23/D 24



Arrows = Wheel-speed sensor plug connector in engine compartment

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical coding



D21

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



D22

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 13 (continued)

Removing wheel-speed sensors on front axle

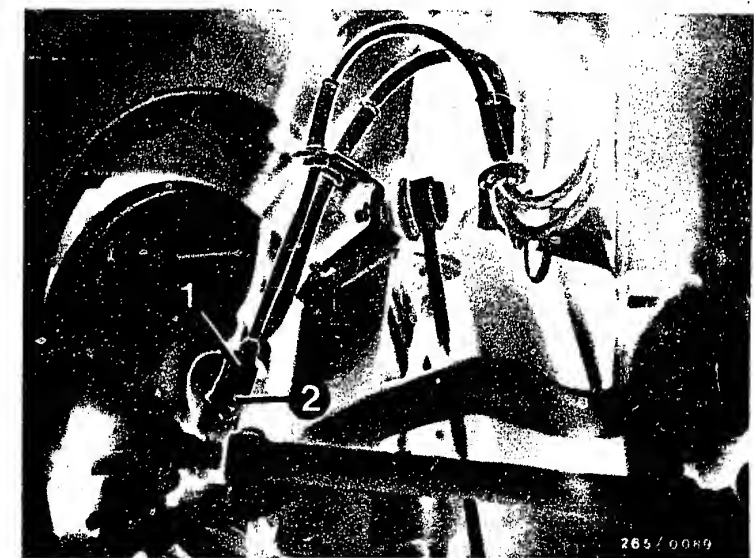
- Undo plug connector (top picture - arrow) in engine compartment.
- Installation positions of plug connectors:
In engine compartment on left and right on firewall.
- Take plug connector out of holder and undo.
- Loosen cable mountings.
- Loosen fastening screw (2) and pull out wheel-speed sensor. Do not use force.

Continued on E1/E2



Arrow = Wheel-speed sensor plug
connector in engine compart-
ment

1 = Wheel-speed sensor
2 = Hexagon-socket-head cap screw



D23

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



D24

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 13 (continued)

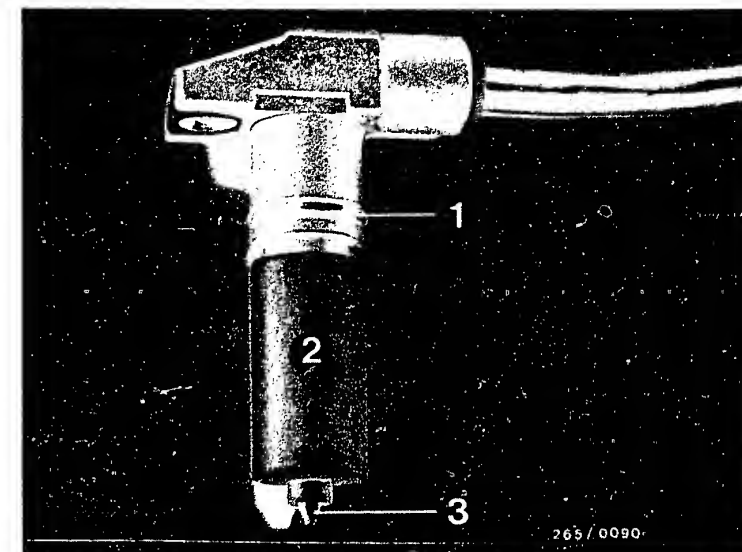
Installing wheel-speed sensors on front axle

- Test O-ring (1) for cracks and replace if necessary.
- Grease wheel-speed sensor housing with Molykote Longterm 2.

Caution!

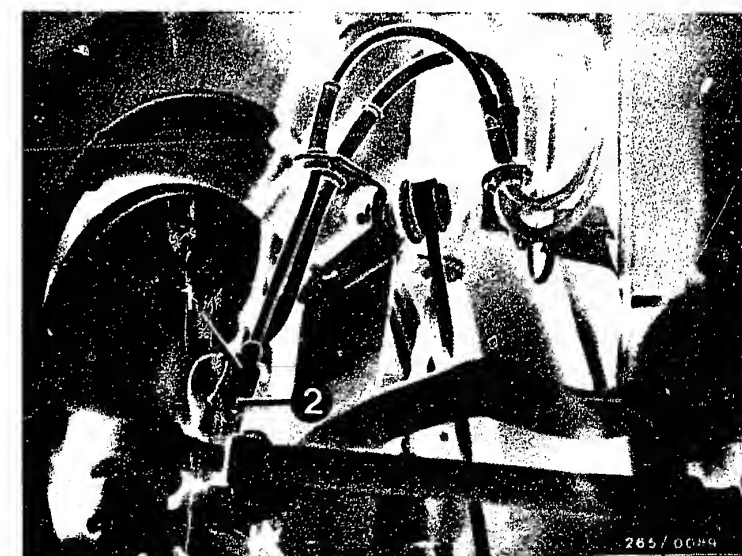
Before installing the wheel-speed sensors, make sure that there are no metallic foreign bodies on the permanently magnetic edges.

- Press wheel-speed sensor into mounting hole. Do not hit. Do not damage O-ring.
- Secure wheel-speed sensor with hexagon-socket-head cap screw.
- Pull cable up into engine compartment and connect to ABS wiring harness by means of the 2-pin plug connector.
- Fully test the ABS with the tester.



1=O-ring
2=Housing
3=Wheel-speed sensor edge

1=Wheel-speed sensor
2=Hexagon-socket-head
cap screw



E1

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



E2

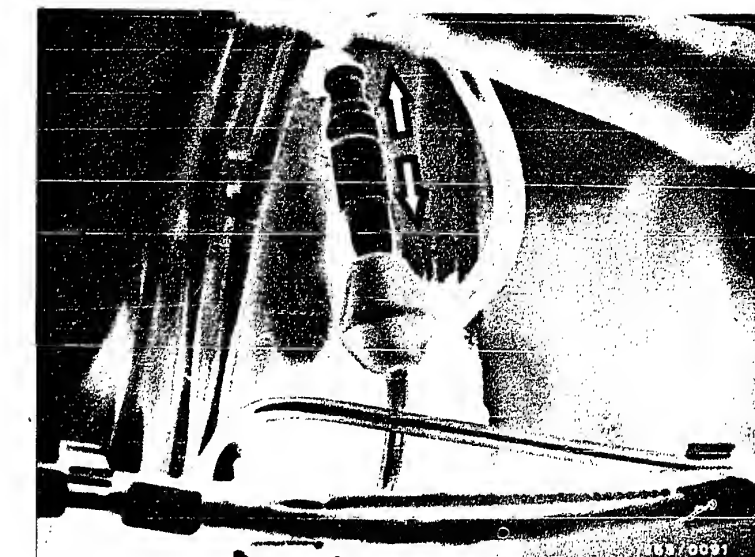
Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



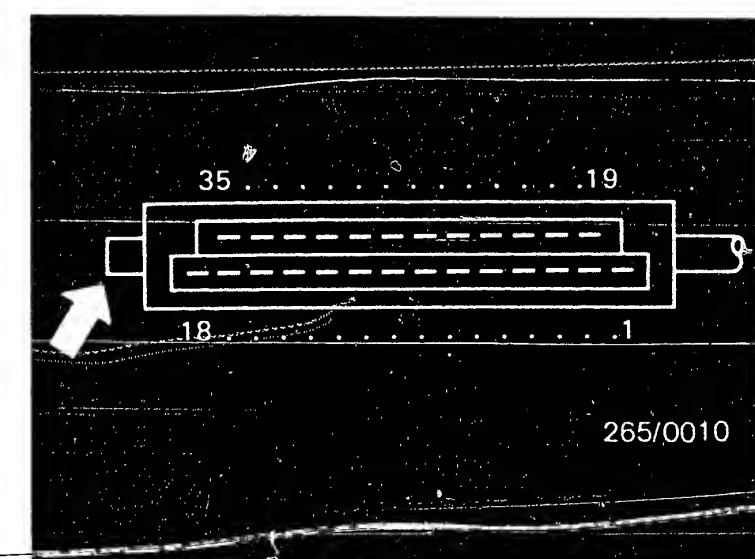
TEST STEP 14

Operation:		Reading:	Testing:
Program-selector switch position	11	Digital display unit: for RL and RR: 20 ... 999 k Ω	Component: Wheel-speed sensors rear left and rear right
Press keys RL and RR one after the other.	●	If reading OK, con- tinue testing with next test step.	Operation: Insulation resistance
Operation in vehicle: Switch on ignition			Malfunction: Reading less than 20 k Ω



Arrows = Wheel-speed sensor plug
connector

Top view of multiple plug K1 (35-pin)
with terminal numbers
Arrow = Lug with mechanical coding



Trouble-shooting (switch off ignition):

Plug connectors OK?

Undo plug connectors and bridge the plug leading to the tester
using wire.

Repeat test:

If reading now OK, replace wheel-speed sensor.

If reading still below the nominal value, the cables from
multiple plug term.7 and term.⑨ or term.②④ and term.②⑥ to
the respective plug are defective.

Check all cables for wear and short circuit to ground.

Continued on E 5/E 6

E3

Test with ABS tester

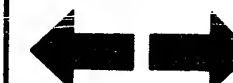
BMW 628 CSi, 633 CSi, 635 CSi



E4

Test with ABS tester

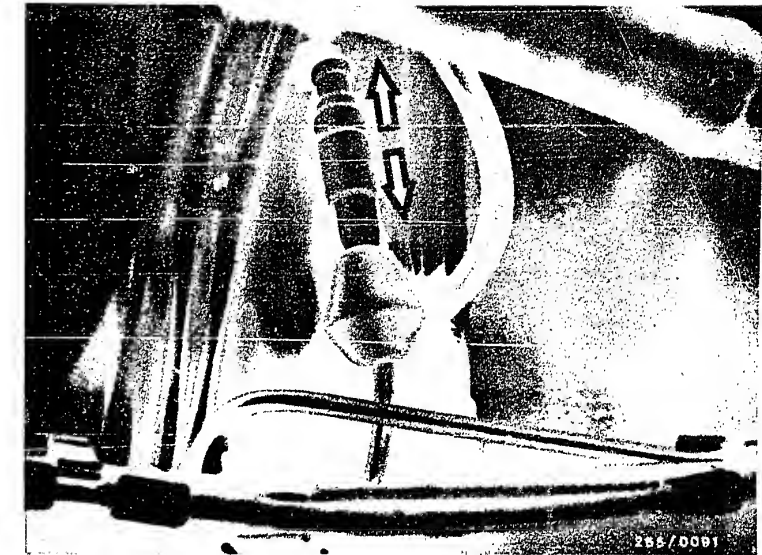
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 14 (continued)

Removing wheel-speed sensors on rear axle

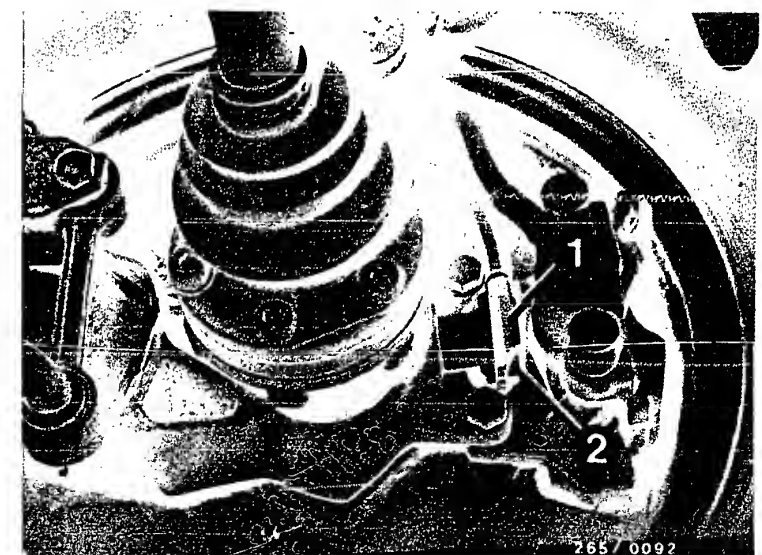
- Rear wheels can be removed to facilitate replacement of the wheel-speed sensors.
- Switch off ignition.
- Remove wheel-speed sensor cable from clamps.
- Pull out rubber sleeve and cable until plug connector can be reached. Do not damage rubber sleeve. Undo plug connector.
- Unscrew brake caliper so that wheel-speed sensor can be pulled out. Brake line remains connected.
- Loosen hexagon-socket-head cap screw (2) and pull out wheel-speed sensor (1). Do not use force.



Arrows = Wheel-speed sensor plug connector

Continued on E 7/E 8

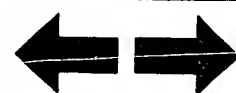
1 = Wheel-speed sensor
2 = Hexagon-socket-head cap screw



E5

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



E6

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 14 (continued)

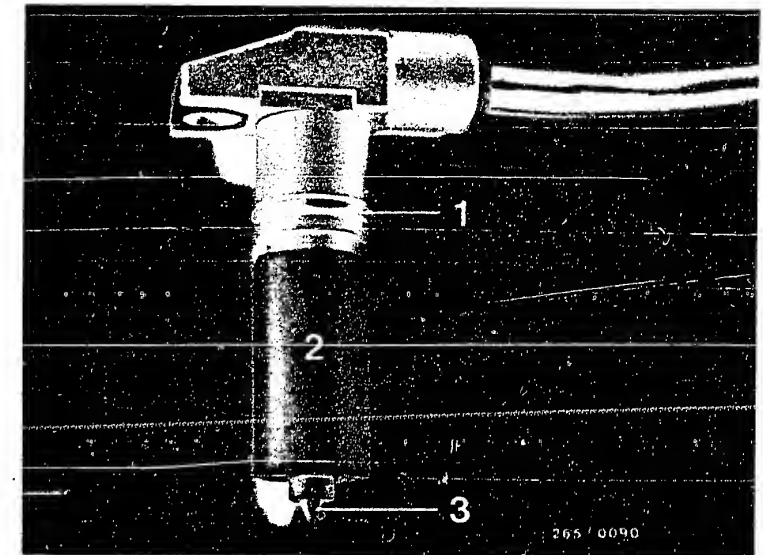
Install wheel-speed sensor on rear axle

- Test O-ring (1) for cracks and replace if necessary.
- Grease wheel-speed sensor housing with Molykote Longterm 2.

Caution!

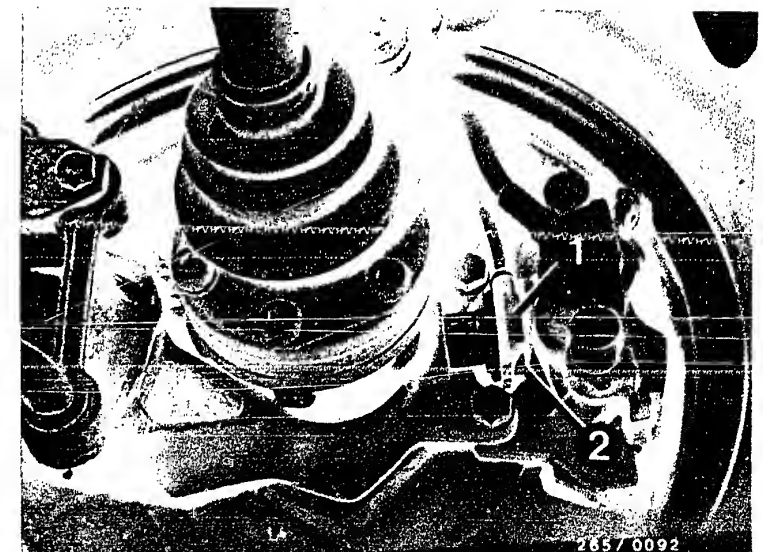
Before installing the wheel-speed sensors, make sure that there are no metallic foreign bodies on the permanently magnetic edges.

- Press wheel-speed sensor into mounting hole. Do not hit. Do not damage O-ring.
- Secure wheel-speed sensor with hexagon-socket-head cap screw.
- Connect wheel-speed sensor to wiring harness and fit plug connector with rubber sleeve into bore.
- Press cable into clamps.
- Screw on brake caliper and mount rear wheel.
- Fully test ABS with tester.



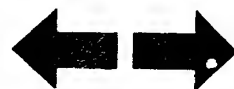
1=O-ring
2=Housing
3=Wheel-speed sensor edge

1=Wheel-speed sensor
2=Hexagon-socket-head
cap screw



E7

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

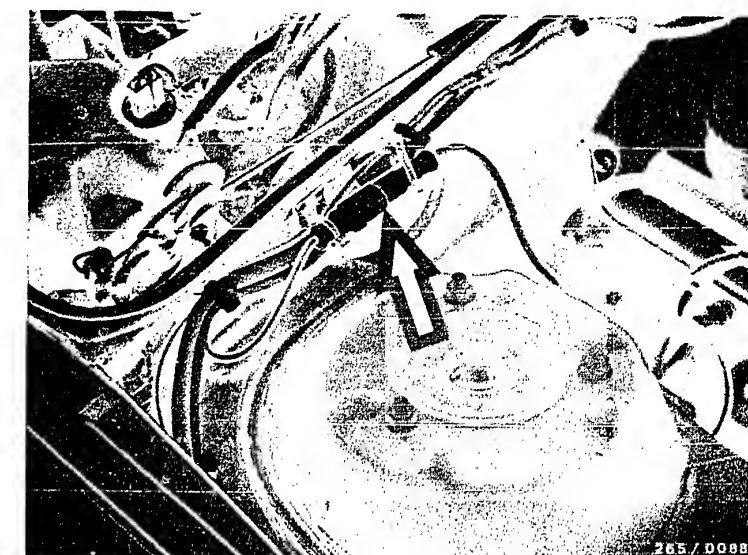


E8

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

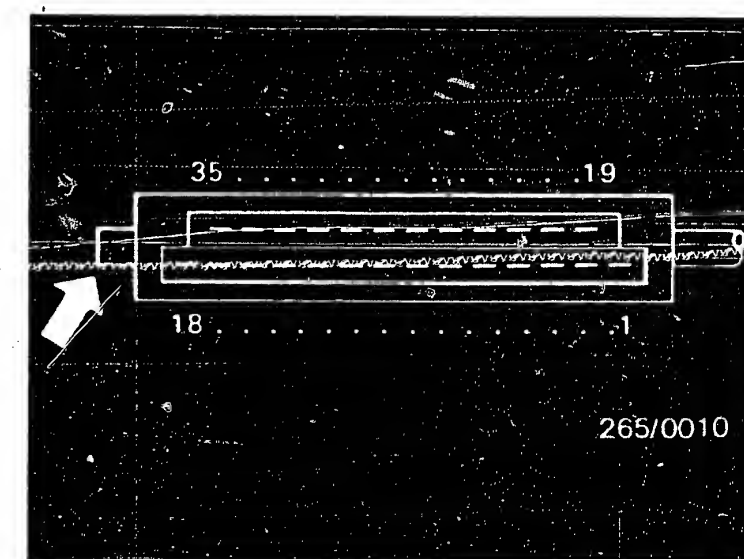


TEST STEP 15			
<u>Operation:</u>		<u>Reading:</u>	<u>Testing:</u>
Program-selector switch position	12	Digital display unit: for FL and FR: <u>0 ... 100 mV</u>	<u>Component:</u> Wheel-speed sensors front left and front right
Press keys FL and FR one after the other	●	If reading OK, continue testing with <u>next test step.</u>	<u>Operation:</u> DC voltage on cable
<u>Operation in vehicle:</u> Switch on ignition			<u>Malfunction:</u> Reading greater than 100 mV



Arrow = Wheel-speed sensor plug connector in engine compartment

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical coding



Trouble-shooting (switch off ignition):

Plug connectors OK?

Undo plug connectors and bridge the plug leading to the tester using wire.

Repeat test:

If reading now OK, replace wheel-speed sensor.

If reading still below the nominal value, the cables from multiple plug term.6 and term.4 or term.23 and term.21 to the respective plug are defective.

Check all cables for wear and short circuit to ground.

Continued on E 11/E 12

E9

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



E10

Test with ABS tester

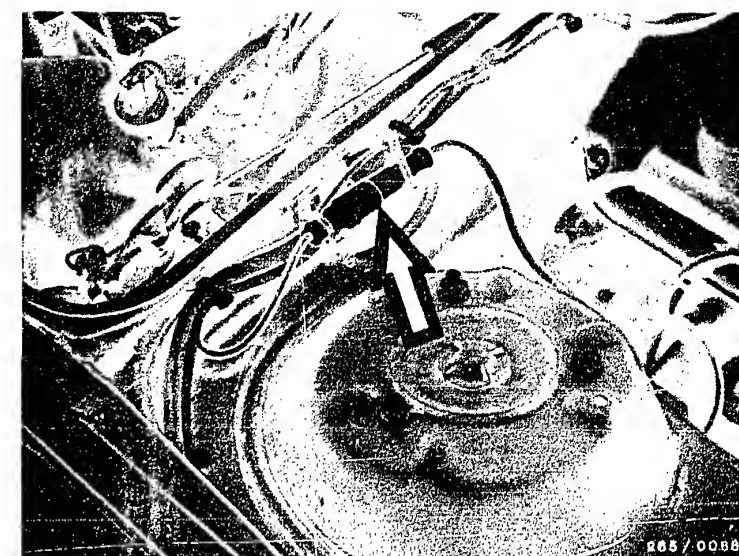
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 15 (continued)

Removing wheel-speed sensors on front axle

- Undo plug connector (top picture - arrow) in engine compartment.
- Installation positions of plug connectors:
In engine compartment on left and right on firewall.
- Undo plug connector.
- Loosen fasteners of cable.
- Loosen fastening screw (2) and pull out wheel-speed sensor. Do not use force.



Arrow = Wheel-speed sensor plug connector in engine compartment

Continued on E 13/E 14

- 1 = Wheel-speed sensor
2 = Hexagon-socket-head cap screw



E11

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



E12

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 15 (continued)

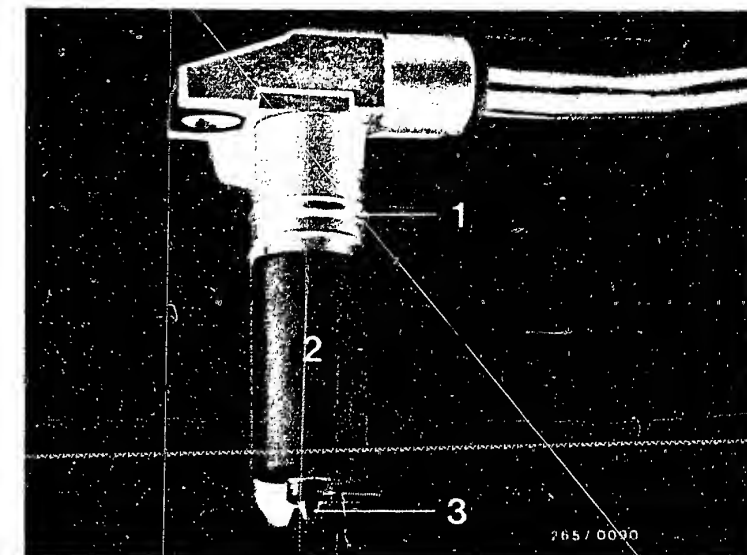
Installing wheel-speed sensors on front axle

- Check O-ring and rubber sleeve for cracks. Replace if necessary.
- Grease wheel-speed-sensor housing with Molykote Longterm 2.

Caution!

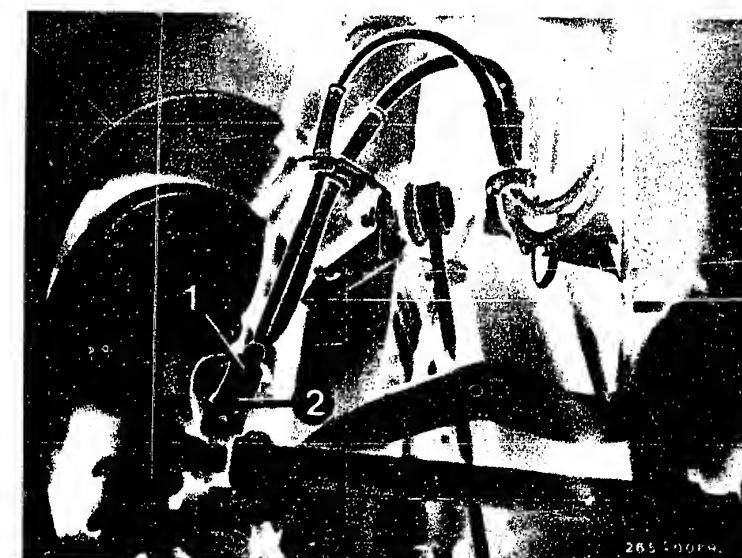
Before installing the wheel-speed sensors, make sure that there are no metallic foreign bodies on the permanently magnetic edges.

- Press wheel-speed sensor into mounting hole. Do not hit. Do not damage O-ring.
- Secure wheel-speed sensor with hexagon-socket-head cap screw.
- Pull cable up into engine compartment and connect to ABS wiring harness by means of the 2-pin plug connector.
- Fully test the ABS with the tester.



- 1 = O-ring
- 2 = Housing
- 3 = Wheel-speed sensor edge

- 1 = Wheel-speed sensor
- 2 = Hexagon-socket-head cap screw



E13

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



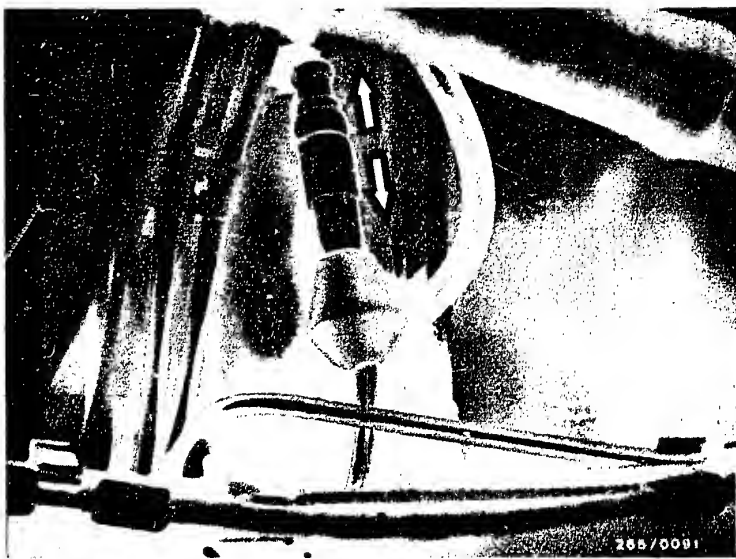
E14

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 16			
Operation:		Reading:	Testing:
Program-selector switch position	12	Digital display unit must indicate <u>0 ... 100 mV.</u>	Component: Wheel-speed sensors rear left and rear right
Press keys RL and RR one after the other	●	If reading OK, continue testing with next test step.	Operation: DC voltage on cable
Operation in vehicle: Switch on ignition			Malfunction: Reading greater than 100 mV



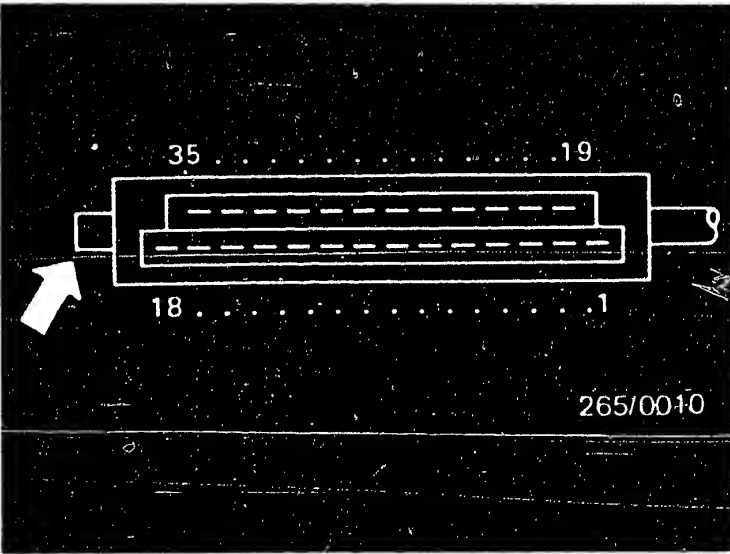
Arrows = Wheel-speed sensor plug connector

Trouble-shooting (switch off ignition):

Plug connectors OK?
 Undo plug connectors and bridge the plug leading to the tester using wire.
 Repeat test:
 If reading now OK, replace wheel-speed sensor.
 If reading still below the nominal value, the cables from multiple plug term.7 and term.9 or term.24 and term.26 to the respective plug are defective.
 Check all cables for wear and short circuit to ground.

Continued on E 17/E 18

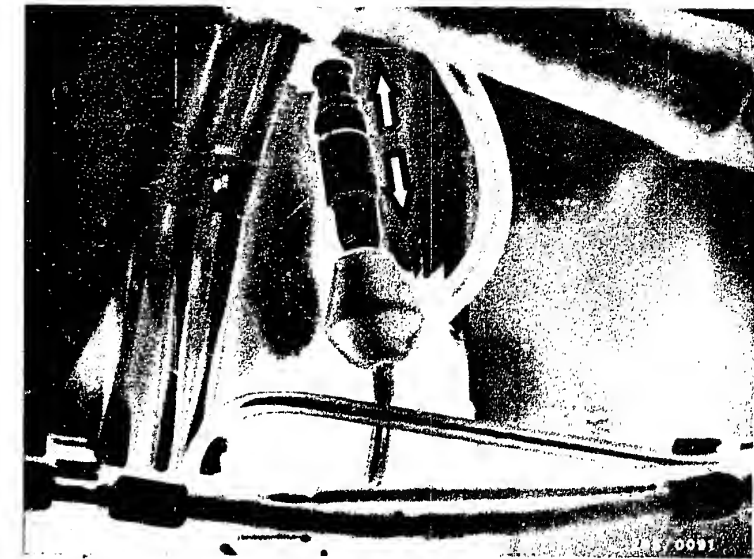
Top view of multiple plug K1 (35-pin) with terminal numbers
 Arrow = Lug with mechanical coding



Trouble-shooting for TEST STEP 16 (continued)

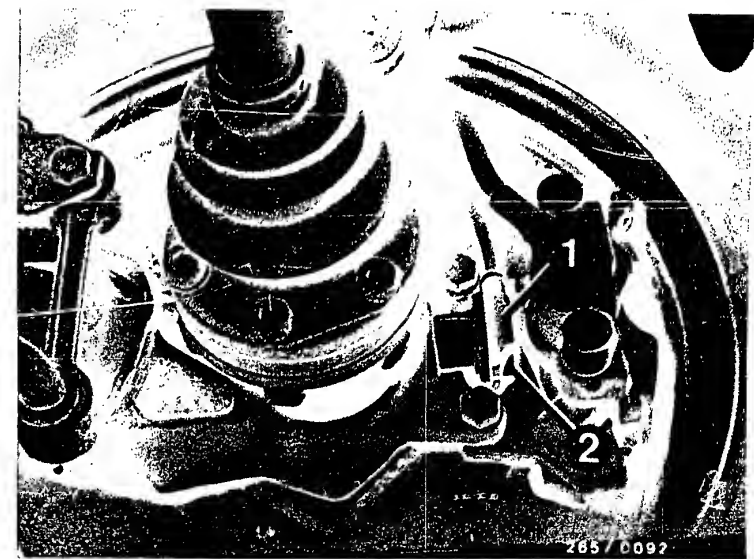
Removing wheel-speed sensors on rear axle

- Rear wheels can be removed to facilitate replacement of the wheel-speed sensors.
- Switch off ignition.
- Remove wheel-speed sensor cable from clamps.
- Pull out rubber sleeve and cable until plug connector can be reached. Do not damage rubber sleeve. Undo plug connector.
- Unscrew brake caliper so that wheel-speed sensor can be pulled out. Brake line remains connected.
- Loosen hexagon-socket-head cap screw (2) and pull out wheel-speed sensor (1). Do not use force.



Arrows = Wheel-speed sensor plug connector

- 1 = Wheel-speed sensor
2 = Hexagon-socket-head cap screw



Continued on E 19/E 20

E17

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



E18

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 16 (continued)

Installing wheel-speed sensors on rear axle

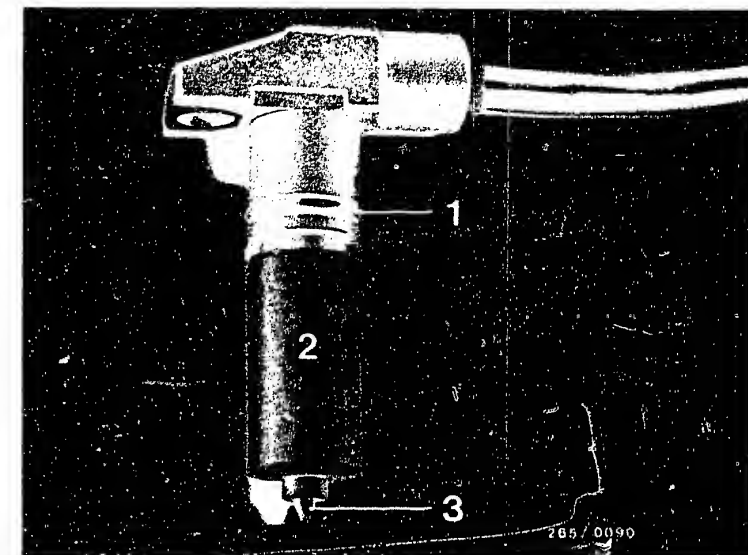
Install wheel-speed sensor on rear axle

- Test O-ring (1) for cracks and replace if necessary.
- Grease wheel-speed sensor housing with Molykote Longterm 2.

Caution!

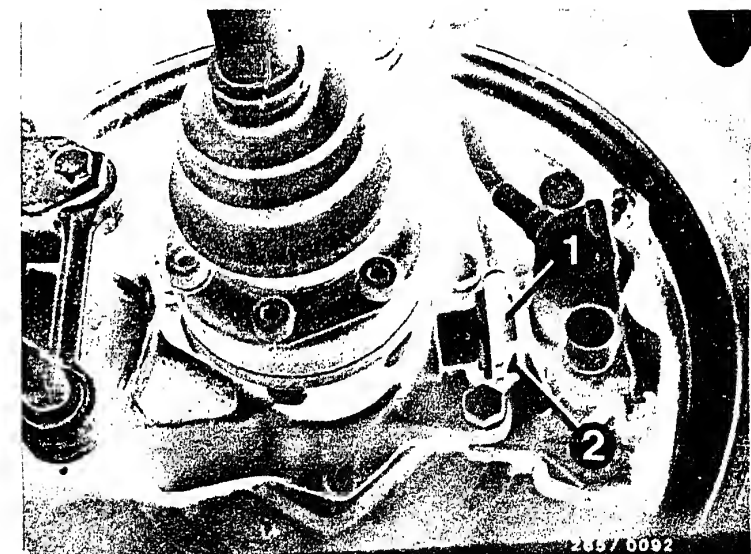
Before installing the wheel-speed sensors, make sure that there are no metallic foreign bodies on the permanently magnetic edges.

- Press wheel-speed sensor into mounting hole. Do not hit. Do not damage O-ring.
- Secure wheel-speed sensor with hexagon-socket-head cap screw.
- Connect wheel-speed sensor to wiring harness and fit plug connector with rubber sleeve into bore.
- Press cable into clamps.
- Screw on brake caliper and mount rear wheel.
- Fully test ABS with tester.



1=O-ring
2=Housing
3=Wheel-speed sensor edge

1=Wheel-speed sensor
2=Hexagon-socket-head
cap screw



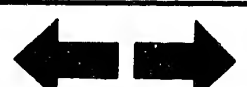
E19

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

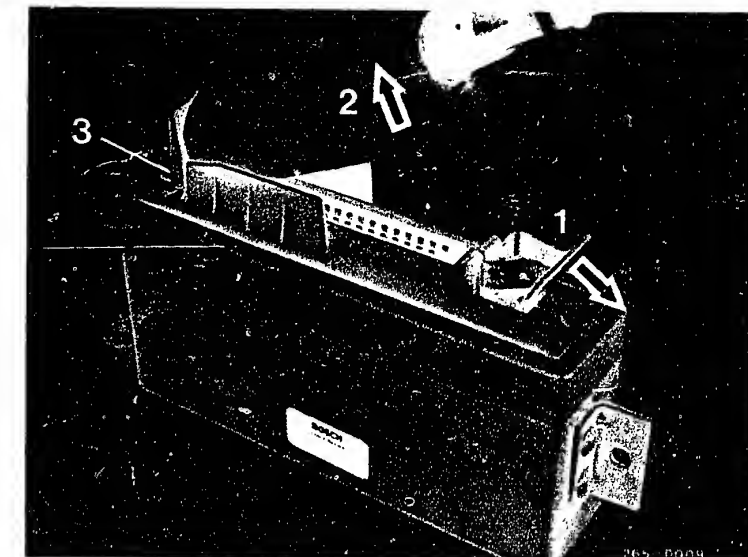


E20

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 17			
Operation:		Reading:	Testing:
Program-selector switch position	13	Digital display unit: 8.85 ... 9.15 V	Component: Controller
Illuminated key lights up, press key	●	For generation 2B (as of end 1983): 4.75 ... 5.25 V	Operation: Internal supply voltage
Operation in vehicle: Switch on Ignition		If reading OK, continue testing with next test step.	Malfunction: Voltage less than 8.85 V/4.75 V or greater than 9.15 V/5.25 V (for generation 2B)



- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

Trouble-shooting:

Replace controller (switch off ignition).

Notes:

- Switch off ignition before disconnecting multiple plug.
- To disconnect multiple plug, press back spring, hinge up multiple plug and unhook from encoding block.
- Install only the specified controller.
- When installing, make sure that multiple plug locks into spring.

Continued on F 3/F 4

F1

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



F2

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 18		Reading:	Testing:
Operation:			
Program-selector switch position	14	Digital display unit must indicate <u>0.4 ... 1.5 V</u>	Component: Hydraulic modulator and indicator lamp
Operation in vehicle: Switch on ignition		Check: ABS indicator lamp in vehicle must light up.	Operation: Diode in forward direction
		If reading OK, continue testing with next test step.	Malfunction: Reading less than 0.4 V or greater than 1.5 V. Indicator lamp does not light up.

Trouble-shooting (switch off ignition)

Indicator lamp does not light up:

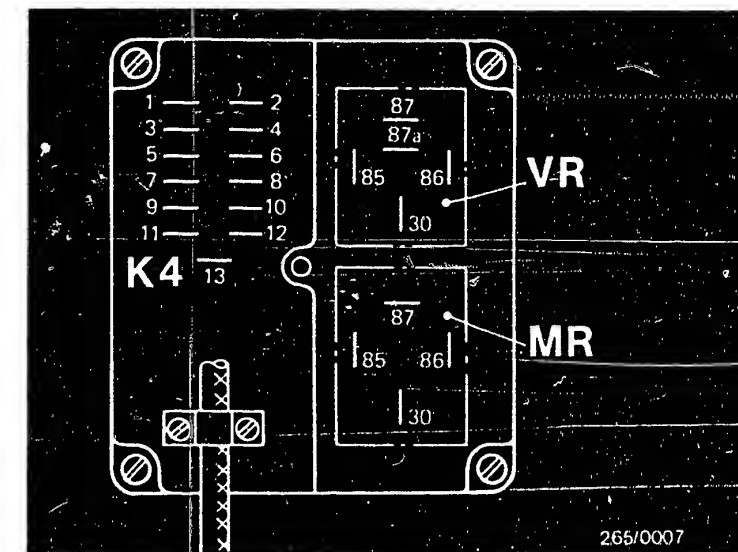
- Indicator lamp defective.
- Open circuit in cable to ignition lock.
- Check for open circuit in cables (29) and (43) from multiple plug K1/term. 29 to hydraulic modulator K3/term.10.
- Check diode in forward and reverse directions with test lamp between K4/term.10 and K4/term.12.

Reading outside tolerance:

- Check diode in forward and reverse directions with test lamp between K4/term.10 and K4/term.12.
- Check for open circuit in cable (29) between multiple plug K1/term.29 and ABS indicator lamp.
- Check for voltage drop at plug-in connections on indicator lamp, K3/term.10, K4/term.10, K3/term.8, K4/term.8 as well as ground cable and valve relay plug-in connections.

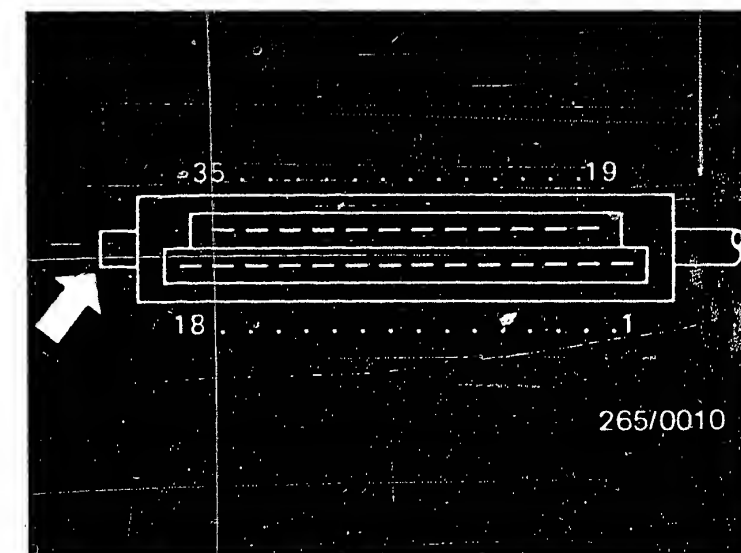
If diode defective, replace hydraulic modulator.

Continued on F 5/F 6



Top view of plug-in plate on hydraulic modulator
Position of terminals
VR = Valve relay
MR = Return-pump relay
K4 = Wiring-harness plug

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical coding



F3

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



F4

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi

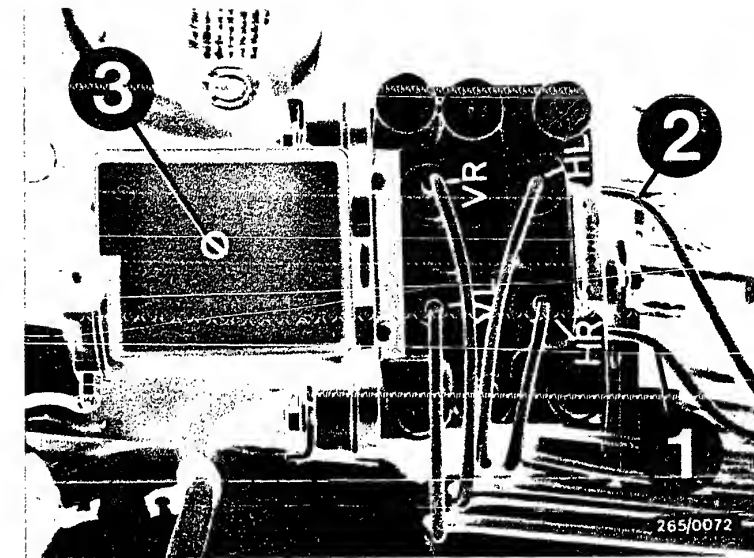


Trouble-shooting for TEST STEP 18 (continued)

Removing the hydraulic modulator

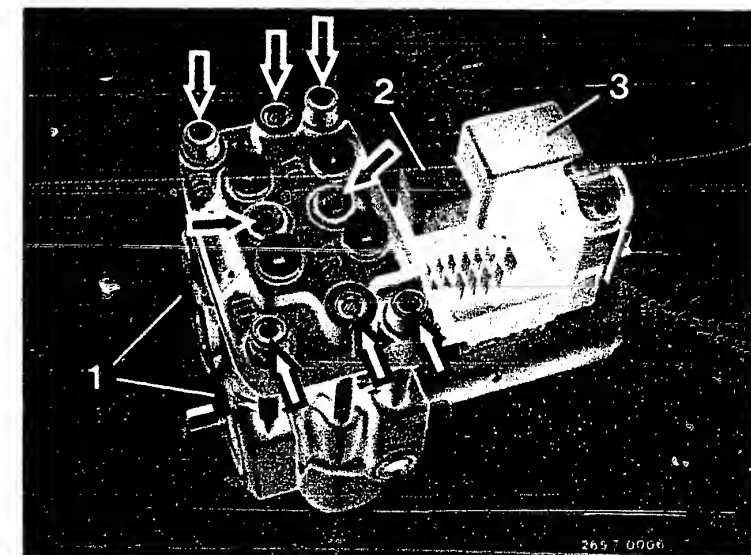
- For safety reasons, the hydraulic modulator must not be repaired, but the complete unit must be replaced.
Exceptions to this are the return-pump relay and the valve relay. Both relays may be replaced.
- Apart from the brake-line connections, it is not permissible to loosen any screws on the hydraulic modulator. In particular the hexagon-socket-head cap screws (bottom picture - arrows) may under no circumstances be loosened. After loosening, it is no longer possible to get the brake circuits leak-tight.
Danger!
- Check the hydraulic modulator and brake-line connections for leaks by means of a visual examination. If brake fluid is escaping, tighten the brake-line connections (12...16 Nm) or replace, or replace the hydraulic modulator.

Continued on F 7/F 8



- 1 = Brake line to front brake master cylinder
- 2 = Brake line to rear brake master cylinder
- 3 = Screw for lid

- 1 = Connection points for brake lines to brake master cylinder
- 2 = Valve relay
- 3 = Return-pump relay



F5

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



F6

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

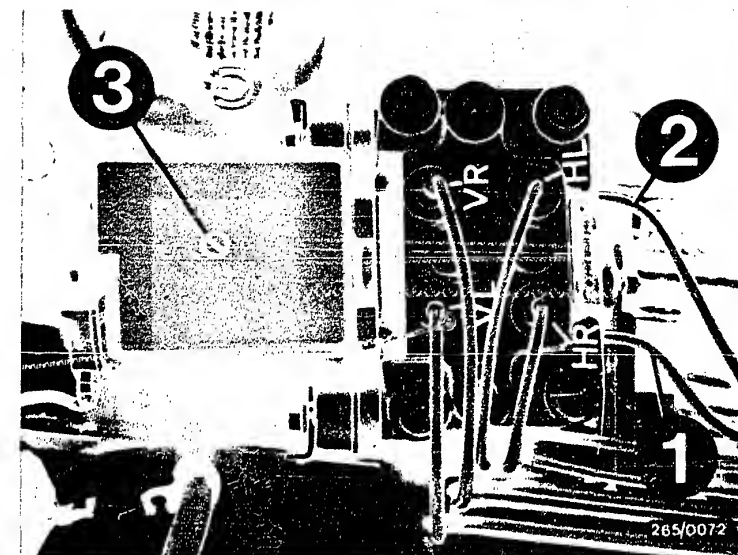


Trouble-shooting for TEST STEP 18 (continued)

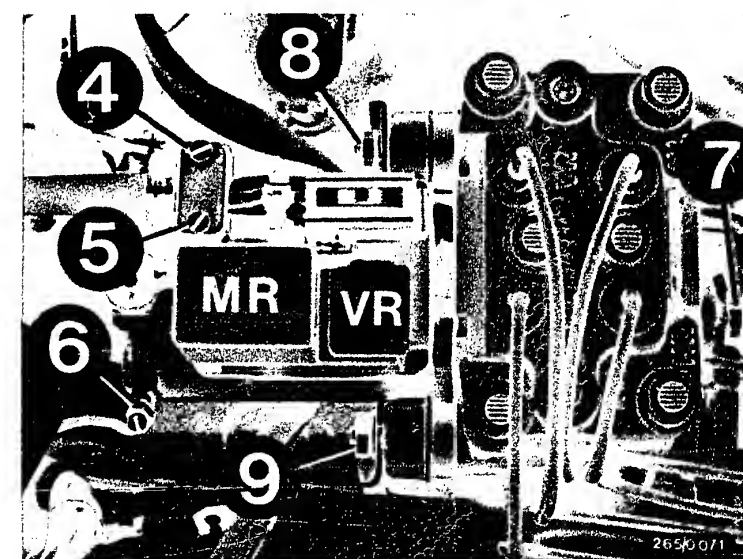
- When removing and installing the brake lines, make sure that the lines are marked in accordance with the markings on the hydraulic modulator and that they are not mixed up when re-connecting (e.g. FL of hydraulic modulator must be connected to the front left wheel brake cylinder).
- Markings on hydraulic modulator
 - VL = Connection for brake line front left (wheel brake cylinder)
 - VR = Connection for brake line front right (wheel brake cylinder)
 - HR = Connection for brake line rear right (wheel brake cylinder)
 - HL = Connection for brake line rear left (wheel brake cylinder)
- Use only the specified double-end flare nut wrench 9x11 mm for loosening and tightening the brake lines.
- Mark brake lines and remove from hydraulic modulator.
- Catch the brake fluid and do not bring it into contact with your skin or clothing or with paintwork.
- Immediately seal the brake lines and connections with dummy plugs.
- Disconnect ground cable (6) from pump motor.
- Loosen fastening screw and remove cover.
- Loosen bracket (4, 5) and remove plug.
- Loosen hexagon nuts from holder (7,8,9) and remove hydraulic modulator.

Installation

- Mount hydraulic modulator in the holder and fasten with the hexagon nuts.
- Connect ground cable to pump motor. Plug on 13-pin plug and fasten with the bracket.
- Fasten cover on the hydraulic modulator with the screw.
- Connect the brake lines to the hydraulic modulator in accordance with the markings.
- Observe the tightening torque for the brake-line connections on the hydraulic modulator: 12...16 Nm.
- Bleed the brake system and check for leaks.
- Fully test the ABS with the tester.



- 1 = Brake line to front brake master cylinder
- 2 = Brake line to rear brake master cylinder
- 3 = Screw for lid
- 4,5 = Screws for wiring harness strain relief
- 6 = Ground terminal for pump motor
- 7,8,9 = Mounting points for hydraulic modulator
- MR = Return-pump relay
- VR = Valve relay



F7

Test with ABS tester

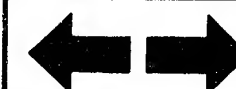
BMW 628 CSi, 633 CSi, 635 CSi



F8

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 19

Operation:

Program-selector switch position

15

Reading:

Digital display unit must indicate

2.5 ... 8.5 V

Testing:

Component:

Hydraulic modulator

Operation:

Diode in reverse direction

Malfunction:

Reading less than 2.5 V or greater than 8.5 V

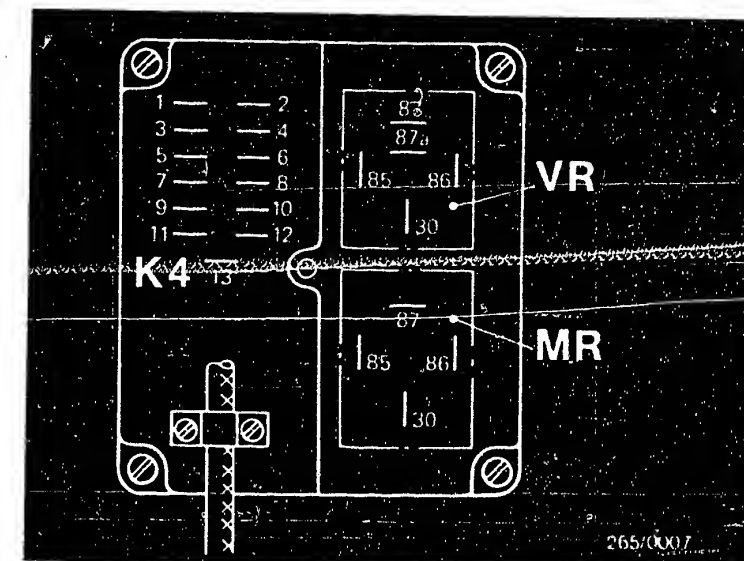
Operation in vehicle:

Switch on ignition

Note:

ABS indicator lamp slightly dimmer.
Valve relay switches.

If reading OK, continue testing with next test step.



Top view of plug-in plate on hydraulic modulator
Position of terminals
VR = Valve relay
MR = Return-pump relay
K4 = Wiring-harness plug

Top view of multiple plug (35-pin) with terminal numbers
Arrow = Lug with mechanical coding

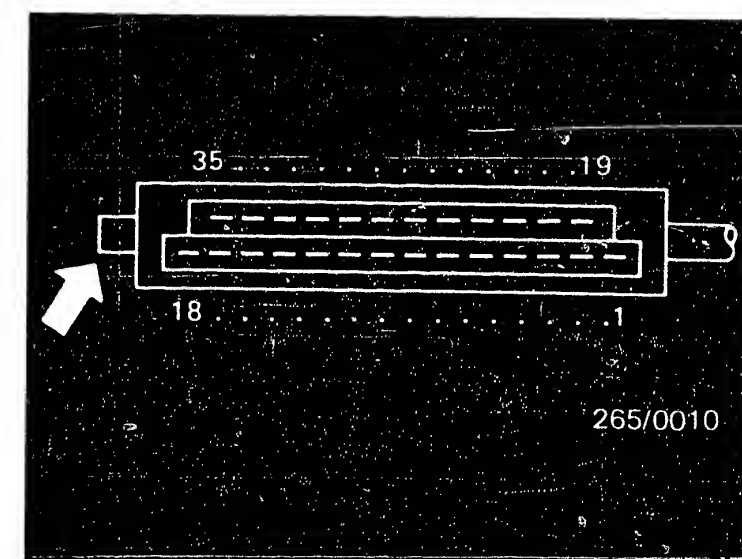
Trouble-shooting (switch off ignition):

Reading outside tolerance:

Check diode in forward and reverse directions with test lamp between K4/term.10 and K4/term.12.

If diode defective, replace hydraulic modulator.

Continued on F 11/F 12



F9

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



F10

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi

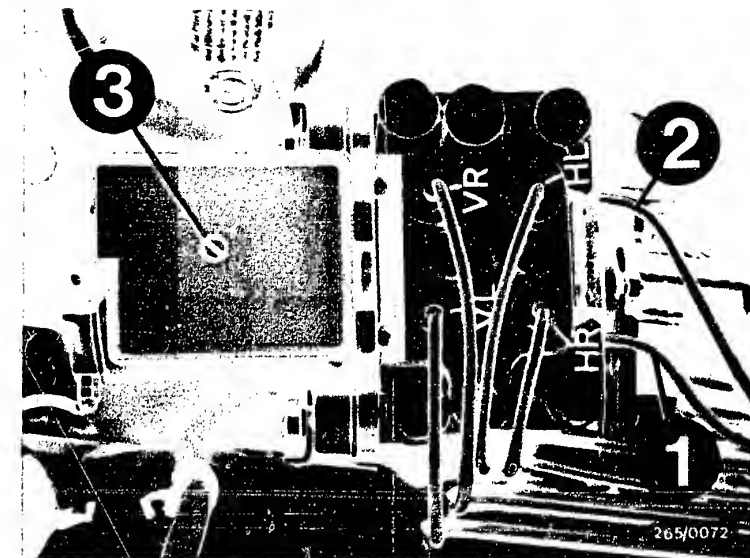


Trouble-shooting for TEST STEP 19 (continued)

Removing the hydraulic modulator

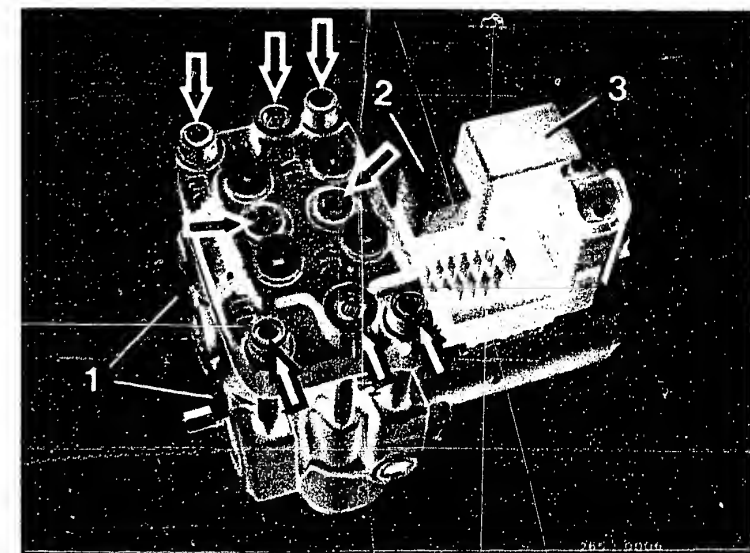
- For safety reasons, the hydraulic modulator must not be repaired, but the complete unit must be replaced. Exceptions to this are the return-pump relay and the valve relay. Both relays may be replaced.
- Apart from the brake-line connections, it is not permissible to loosen any screws on the hydraulic modulator. In particular the hexagon-socket-head cap screws (bottom picture - arrows) may under no circumstances be loosened. After loosening, it is no longer possible to get the brake circuits leak-tight.
Danger!
- Check the hydraulic modulator and brake-line connections for leaks by means of a visual examination. If brake fluid is escaping, tighten the brake-line connections (12...16 Nm) or replace, or replace the hydraulic modulator.

Continued on F 13/F 14



- 1 = Brake line to front brake master cylinder
- 2 = Brake line to rear brake master cylinder
- 3 = Screw for lid

- 1 = Connection points for brake lines to brake master cylinder
- 2 = Valve relay
- 3 = Return-pump relay



F11

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



F12

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi

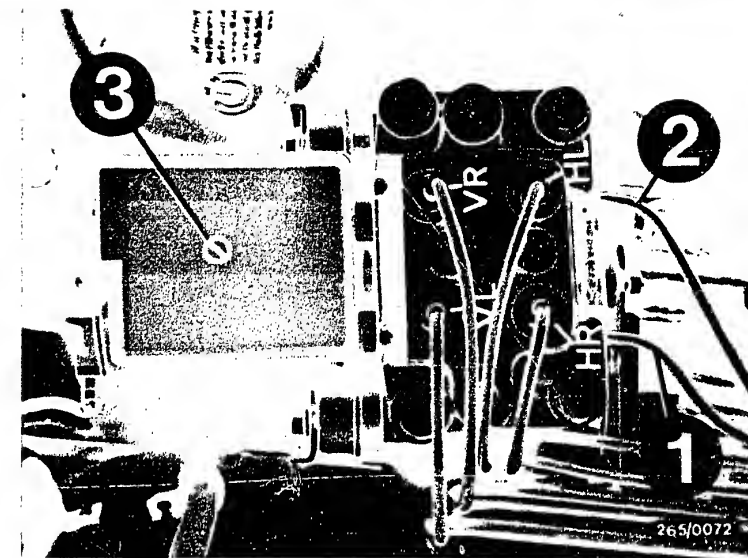


Trouble-shooting for TEST STEP 19 (continued)

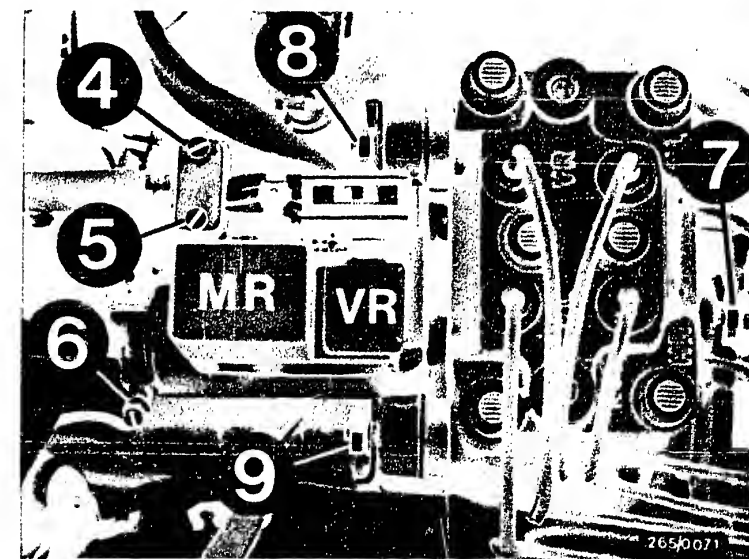
- When removing and installing the brake lines, make sure that the lines are marked in accordance with the markings on the hydraulic modulator and that they are not mixed up when re-connecting (e.g. FL of hydraulic modulator must be connected to the front left wheel brake cylinder).
- Markings on hydraulic modulator
 - VL = Connection for brake line front left (wheel brake cylinder)
 - VR = Connection for brake line front right (wheel brake cylinder)
 - HR = Connection for brake line rear right (wheel brake cylinder)
 - HL = Connection for brake line rear left (wheel brake cylinder)
- Use only the specified double-end flare nut wrench 9x11 mm for loosening and tightening the brake lines.
- Mark brake lines and remove from hydraulic modulator.
- Catch the brake fluid and do not bring it into contact with your skin or clothing or with paintwork.
- Immediately seal the brake lines and connections with dummy plugs.
- Disconnect ground cable (6) from pump motor.
- Loosen fastening screw and remove cover.
- Loosen bracket and remove plug.
- Loosen hexagon nuts from holder (7,8,9) and remove hydraulic modulator.

Installation

- Mount hydraulic modulator in the holder and fasten with the hexagon nuts.
- Connect ground cable to pump motor. Plug on 13-pin plug and fasten with the bracket.
- Fasten cover on the hydraulic modulator with the screw.
- Connect the brake lines to the hydraulic modulator in accordance with the markings.
- Observe the tightening torque for the brake-line connections on the hydraulic modulator: 12...16 Nm.
- Bleed the brake system and check for leaks.
- Fully test the ABS with the tester.



- 1 = Brake line to front brake master cylinder
- 2 = Brake line to rear brake master cylinder
- 3 = Screw for lid
- 4,5 = Screws for wiring harness strain relief
- 6 = Ground terminal for pump motor
- 7,8,9 = Mounting points for hydraulic modulator
- MR = Return-pump relay
- VR = Valve relay

**F13**

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi

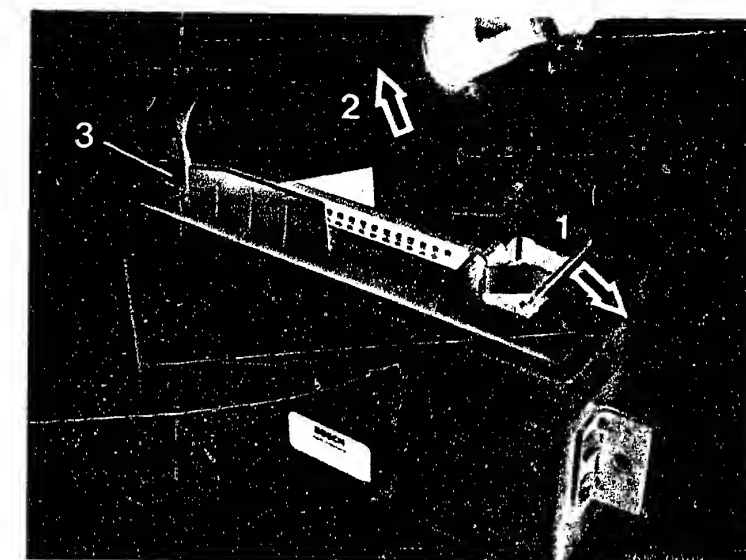
**F14**

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 20		Reading:	Testing:
Operation:			
Program-selector switch position	16	Watch ABS indicator lamp in vehicle: After pressing the illuminated key the lamp must go out within 1 second Lamp may flash twice. If reading OK, continue testing with next test step.	<u>Component:</u> Controller
Illuminated key lights up. Press key for at least 3 seconds.	●		<u>Operation:</u> BITE* triggering
<u>Operation in vehicle:</u> Switch off ignition			<u>Malfunction:</u> Indicator lamp does not go out



- 1 = Spring
 2 = Multiple plug (35-pin)
 3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

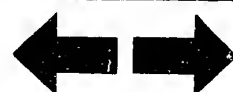
Notes:

- Switch off ignition before disconnecting multiple plug.
- To disconnect multiple plug, press back spring, hinge up multiple plug and unhook from encoding block.
- Install only the specified controller.
- When installing, make sure that the multiple plug locks into the spring.

*BITE = Built-in test circuit

F15

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

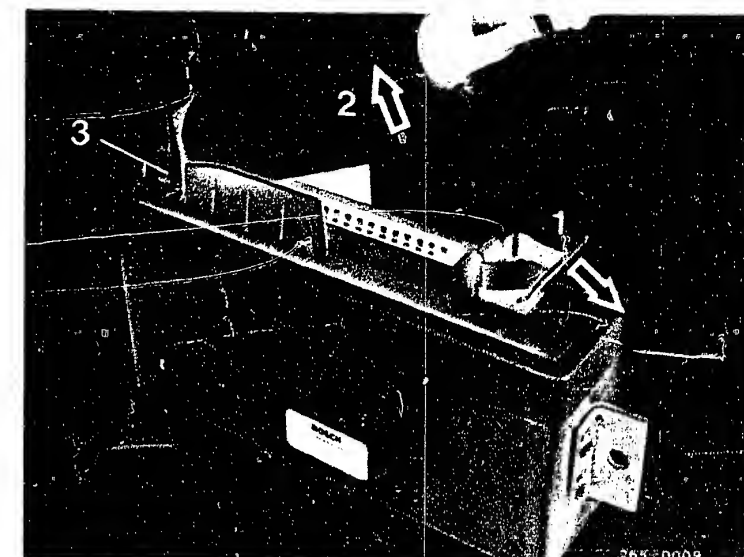


F16

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 21			
<u>Operation:</u>		<u>Reading:</u>	<u>Testing:</u>
Program-selector switch position	17	Watch ABS indicator lamp in vehicle: Lamp <u>must light up</u> as long as the key is pressed. Lamp may flash twice. If reading OK, <u>continue testing with next test step.</u>	<u>Component:</u> Controller
Illuminated key lights up. Press key for at least 3 seconds.	●		<u>Operation:</u> BITE* program with fault simulation
<u>Operation in vehicle:</u> Switch on ignition			<u>Malfunction:</u> Indicator lamp goes out.



- 1 = Spring
 2 = Multiple plug (35-pin)
 3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

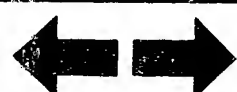
- Switch off ignition before disconnecting multiple plug.
- To disconnect multiple plug, press back spring, hinge up multiple plug and unhook from encoding block.
- Install only the specified controller.
- When installing, make sure that the multiple plug locks into the spring.

*BITE = Built-in test circuit

F17

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



F18

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



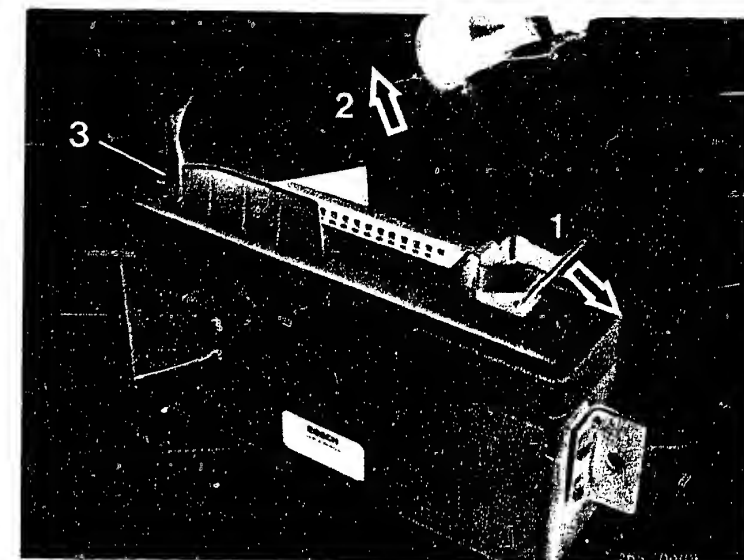
TEST STEP 22			
<u>Operation:</u>		<u>Reading:</u>	<u>Testing:</u>
Program-selector switch position	18	Digital display unit must indicate <u>1.9 ... 2.3 A</u>	<u>Component:</u> Controller
Press key FL	●		
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key).	●		<u>Operation:</u> Valve current. Pressure holding front left
<u>Operation in vehicle:</u> Switch on ignition		<u>Note:</u> Pump motor starts up. If reading OK, continue testing with <u>next test step.</u>	<u>Malfunction:</u> Current less than 1.9 A or greater than 2.3 A

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off the ignition before disconnecting the multiple plug.
- To disconnect the multiple plug, push back the spring, hinge up the multiple plug and unhook from encoding block.
- Install only the specified controller.
- When installing, make sure that the multiple plug locks into the spring.



- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

F19

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

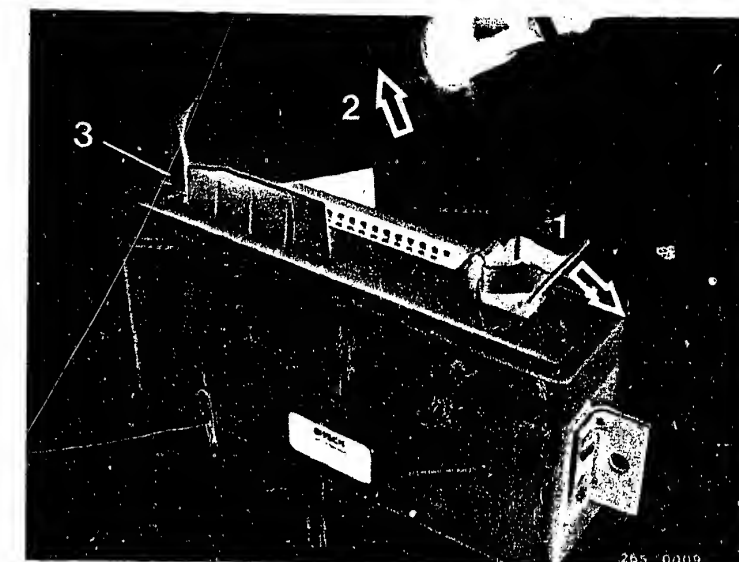


F20

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 23			
Operation:		Reading:	Testing:
Program-selector switch position	18	Digital display unit must indicate <u>1.9 ... 2.3 A</u>	<u>Component:</u> Controller
Press key FR	●		
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key).	●	<u>Note:</u> Pump motor starts up. If reading OK, continue testing with next test step.	<u>Operation:</u> Valve current. Pressure holding front right
<u>Operation in vehicle:</u> Switch on ignition			<u>Malfunction:</u> Current less than 1.9A or greater than 2.3A



- 1 = Spring
 2 = Multiple plug (35-pin)
 3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

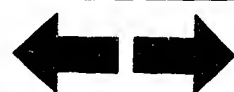
Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off the ignition before disconnecting the multiple plug.
- To disconnect the multiple plug, push back the spring, hinge up the multiple plug and unhook from encoding block.
- Install only the specified controller.
- When installing, make sure that the multiple plug locks into the spring.

F21

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



F22

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



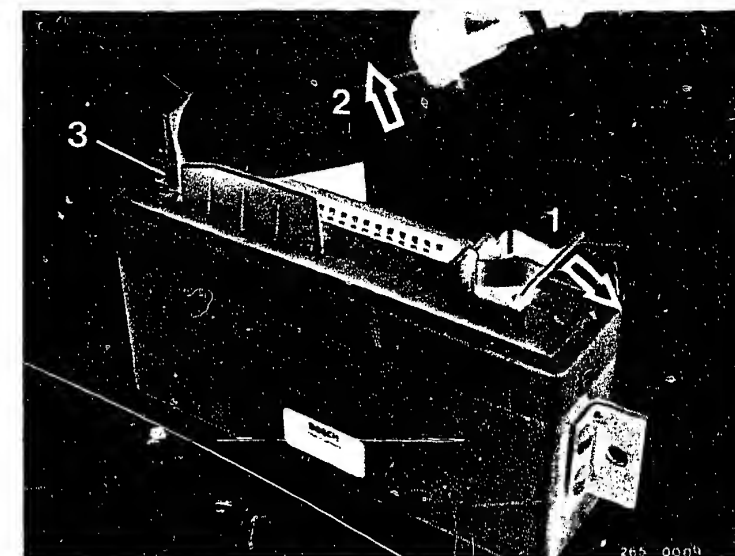
TEST STEP 24			
Operation:		Reading:	Testing:
Program-selector switch position	18	Digital display unit must indicate 1.9 ... 2.3 A	Component: Controller
Press key RL	●		Operation: Valve current. Pressure holding rear left
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key).	●	Note: Pump motor starts up. If reading OK, continue testing with next test step.	Malfunction: Current less than 1.9 A or greater than 2.3 A
Operation in vehicle: Switch on ignition			

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off the ignition before disconnecting the multiple plug.
- To disconnect the multiple plug, push back the spring, hinge up the multiple plug and unhook from encoding block.
- Install only the specified controller.
- When installing, make sure that the multiple plug locks into the spring.



- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

F23

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

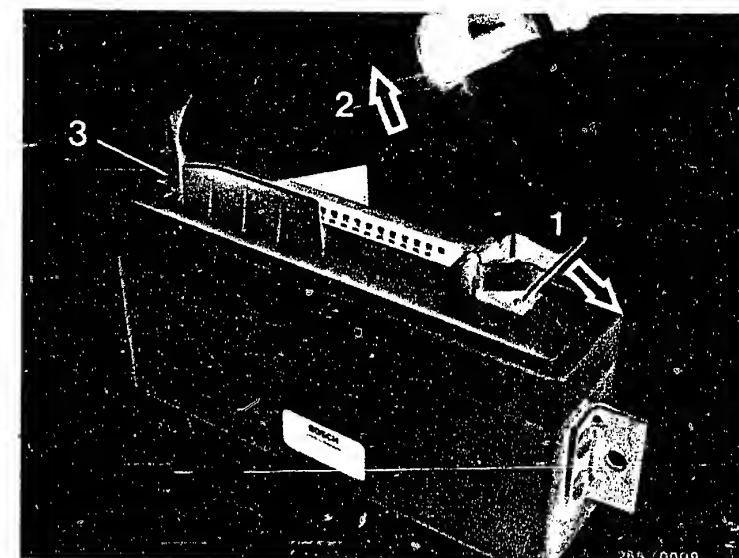


F24

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 25			
Operation:		Reading:	Testing:
Program-selector switch position	18	Digital display unit must indicate <u>1.9 ... 2.3 A</u>	<u>Component:</u> Controller
Press key RR	●		<u>Operation:</u> Valve current. Pressure holding rear right
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key).	●		<u>Malfunction:</u> Current less than 1.9 A or greater than 2.3 A
<u>Operation in vehicle:</u> Switch on ignition		<u>Note:</u> Pump motor starts up. If reading OK, continue testing with next test step.	



- 1 = Spring
 2 = Multiple plug (35-pin)
 3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off the ignition before disconnecting the multiple plug.
- To disconnect the multiple plug, push back the spring, hinge up the multiple plug and unhook from encoding block.
- Install only the specified controller.
- When installing, make sure that the multiple plug locks into the spring.

G1

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

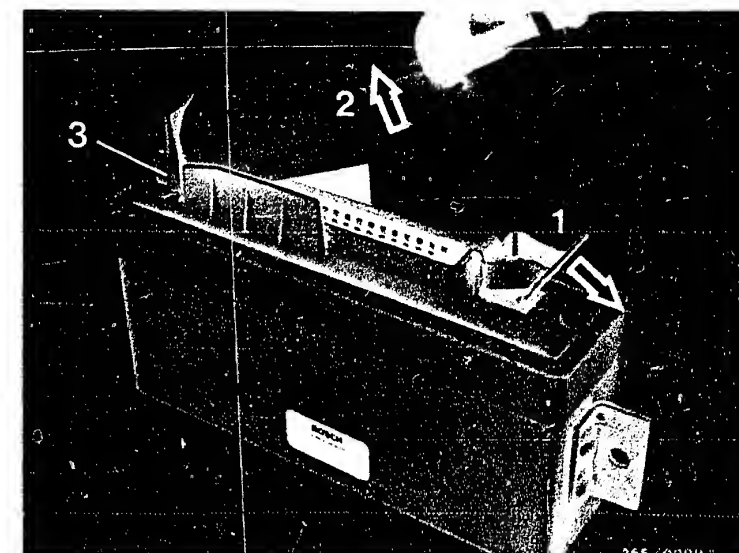


G2

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 26			
Operation:		Reading:	Testing:
Program-selector switch position	19	Digital display unit must indicate <u>4.5...5.7 A.</u>	<u>Component:</u> Controller
Press key FL	●		<u>Operation:</u> Valve current, pressure reduction front left
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key)	●	For generation 2B (as of end 1983): <u>4.5...6.0 A</u> <u>Note:</u> Pump motor starts up. If reading OK, continue testing with next test step.	<u>Malfunction:</u> Current less than 4.5 A or greater than 5.7 A/6.0 A
<u>Operation in vehicle:</u> Switch on ignition			



- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off the ignition before disconnecting the multiple plug.
- To disconnect the multiple plug, push back the spring, hinge up the multiple plug and unhook from encoding block.
- Install only the specified controller.
- When installing, make sure that the multiple plug locks into the spring.

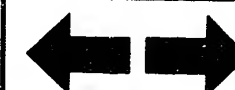
G3

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

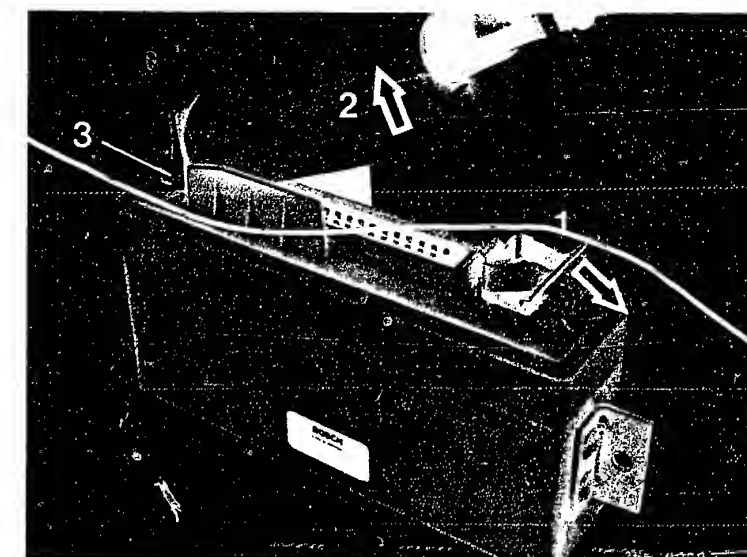


G4

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 27			
Operation:		Reading:	Testing:
Program-selector switch position	19	Digital display unit must indicate <u>4.5...5.7 A.</u> For generation 2B (as of end 1983): <u>4.5...6.0 A</u> <u>Note:</u> Pump motor starts up. If reading OK, continue testing with next test step.	<u>Component:</u> Controller
Press key FR	●		<u>Operation:</u> Valve current, pressure reduction front right
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key)	●		<u>Malfunction:</u> Current less than 4.5 A or greater than 5.7 A/6.0 A
<u>Operation in vehicle:</u> Switch on ignition			



- 1 = Spring
 2 = Multiple plug (35-pin)
 3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off the ignition before disconnecting the multiple plug.
- To disconnect the multiple plug, push back the spring, hinge up the multiple plug and unhook from encoding block.
- Install only the specified controller.
- When installing, make sure that the multiple plug locks into the spring.

G5

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi

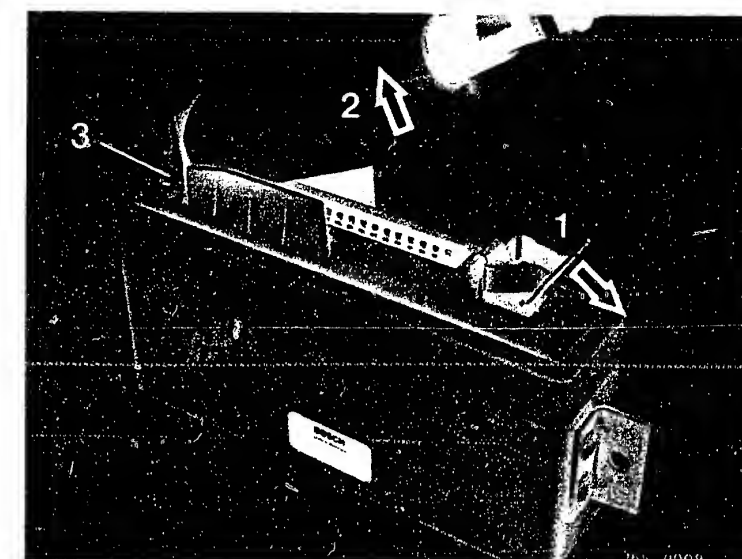


G6

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 28			
Operation:		Reading:	Testing:
Program-selector switch position	19	Digital display unit must indicate <u>4.5...5.7 A.</u> For generation 2B (as of end 1983): <u>4.5...6.0 A</u> <u>Note:</u> Pump motor starts up. If reading OK, continue testing with next test step.	<u>Component:</u> Controller
Press key RL	●		<u>Operation:</u> Valve current, pressure reduction rear left
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key)	●		<u>Malfunction:</u> Current less than 4.5 A or greater than 5.7 A/6.0 A
<u>Operation in vehicle:</u> Switch on ignition			



- 1 = Spring
 2 = Multiple plug (35-pin)
 3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Display jumps to zero after a few seconds. If the test step is to be repeated, press the key again.
- Switch off the ignition before disconnecting the multiple plug.
- To disconnect the multiple plug, push back the spring, hinge up the multiple plug and unhook from encoding block.
- Install only the specified controller.
- When installing, make sure that the multiple plug locks into the spring.

G7

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



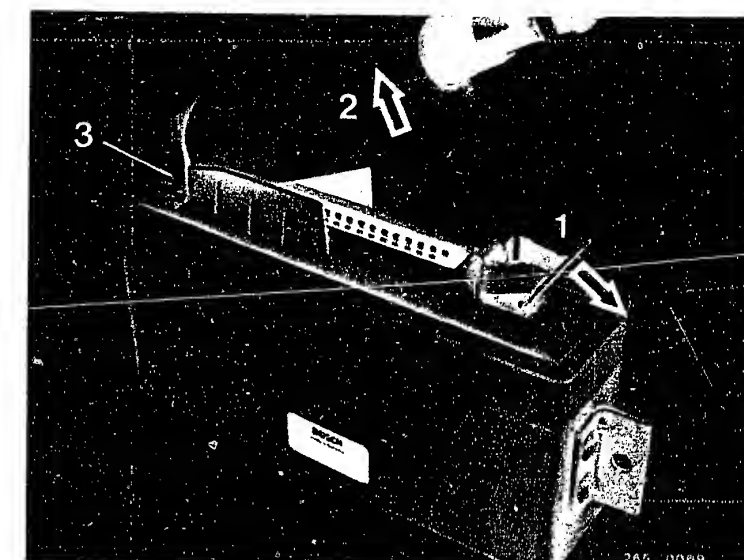
G8

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 29

Operation:		Reading:	Testing:
Program-selector switch position	19	Digital display unit must indicate <u>4.5...5.7 A.</u>	Component: Controller
Press key RR	●		
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key)	●	For generation 2B (as of end 1983): <u>4.5...6.0 A</u> Note: Pump motor starts up. If reading OK, continue testing with next test step.	Operation: Valve current, pressure reduction rear right
Operation in vehicle: Switch on ignition			Malfunction: Current less than 4.5 A or greater than 5.7 A/6.0 A



- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

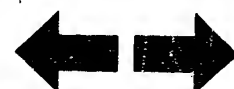
Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off the ignition before disconnecting the multiple plug.
- To disconnect the multiple plug, push back the spring, hinge up the multiple plug and unhook from encoding block.
- Install only the specified controller.
- When installing, make sure that the multiple plug locks into the spring.

G9

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



G10

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



A dynamic brake analyzer (DBA) is necessary for program-selector switch positions 20, 21, 22 and 23.

Caution:

Do not drive with the tester connected.

Do not use a brake-pedal actuating device for setting the brake-pedal force.

Carry out program-selector switch position 23 first since it is assumed in the following test steps that the wheel-speed sensors are in proper working condition.

If the test specification is not reached, do not carry out the test steps with the program switch in position 20, 21 and 22 since, otherwise, the brake master cylinder may be destroyed.

Be sure to observe the sequence of operations.

G11

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 30

Operation:

Program-selector switch position

23

Additional operations:

- Drive front wheels of vehicle onto dynamic brake analyzer
- Pull on the handbrake.

Caution!

In vehicles with automatic transmission make sure that selector lever is not in parking position (P).

- Switch on the ignition.
- Select wheel FL with key FL.
- Switch on left-hand brake roller.
- Make reading.

Reading:

Digital display unit must indicate

1.2 ... 19

In case of fluctuating readings, the lowest reading is valid.

Note:

If reading is 1.2, check air gap.

If reading OK, continue testing with next test step.

Testing:

Component:

Wheel-speed sensor front left

Operation:

Signal and mixing up of connecting cables

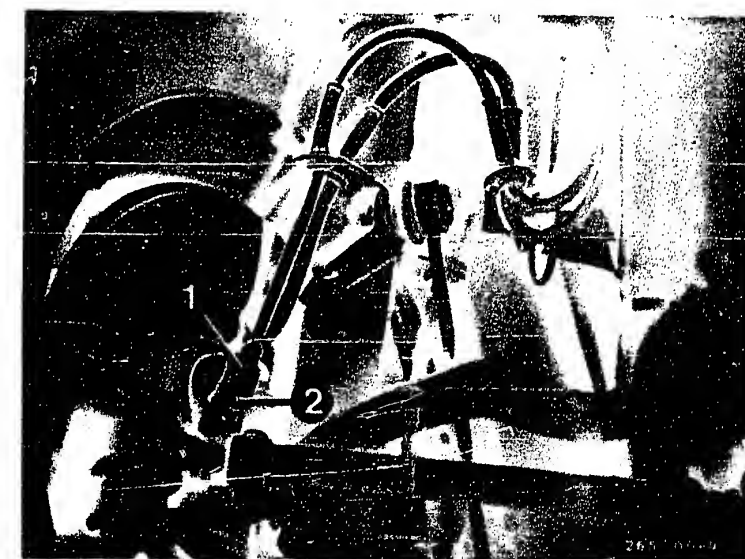
Malfunction:

Reading less than 1,2 or greater than 19



Arrow = Wheel-speed sensor plug connector in engine compartment

1 = Wheel-speed sensor
2 = Hexagon-socket-head screw



Trouble-shooting: (switch off ignition)

A reading of 999 signifies:

- Speed of dynamic brake analyzer too great (above approx. 13 km/h)

Continued on G 14/G 15

G12

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



G13

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 30 (continued)

Reading of 0 or less than 1.2

- Be sure to remedy fault before continuing testing with the program switch in position 20, 21 and 22.
- Wheel-speed sensors reversed? Check assignment: Wheel-speed sensors must correspond to the specified wheel and controller input. If necessary, compare with circuit diagram.
- Air gap between wheel-speed sensor and ring gear too great. Check installation.
- Check wheel-bearing play.
- Replace wheel-speed sensor.

Remove wheel-speed sensors on front axle

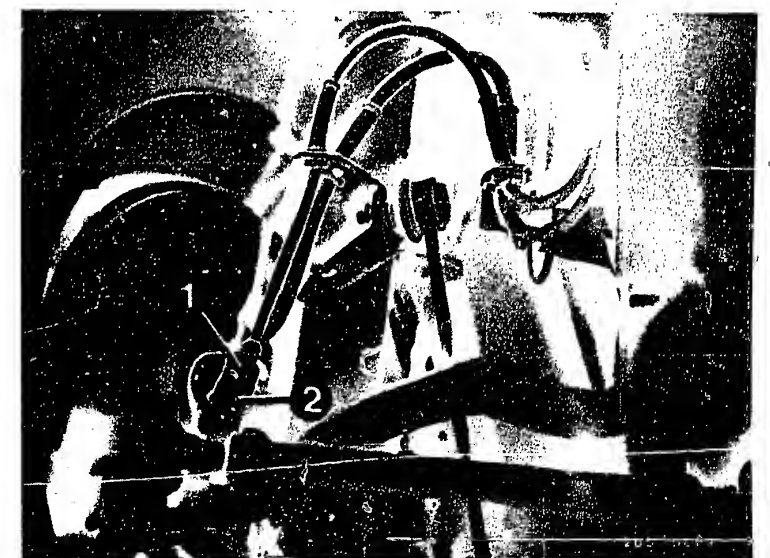
- Installation positions of plug connectors:
In engine compartment on left and right on firewall.
- Undo plug connector (arrow).
- Loosen cable mountings.
- Loosen fastening screw (2) and pull out wheel-speed sensor. Do not use force.

Continued on G 16/G 17



Arrow = Wheel-speed sensor plug
connector in engine
compartment

1 = Wheel-speed sensor
2 = Hexagon-socket-head cap screw



G 14

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



G 15

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 30 (continued)

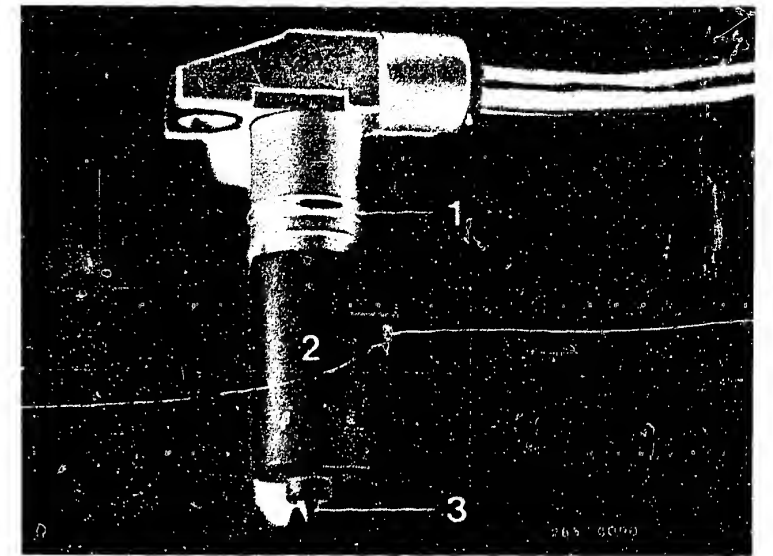
Installing wheel-speed sensors on front axle

- Test O-ring (1) for cracks and replace if necessary.
- Grease wheel-speed sensor housing with Molykote Longterm 2.

Caution!

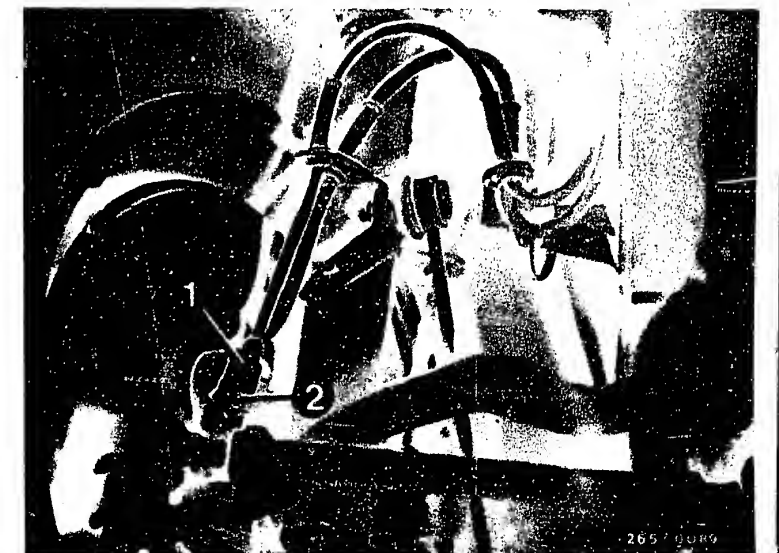
Before installing the wheel-speed sensors, make sure that there are no metallic foreign bodies on the permanently magnetic edges.

- Press wheel-speed sensor into mounting hole. Do not hit. Do not damage O-ring.
- Secure wheel-speed sensor with hexagon-socket-head cap screw.
- Pull cable up into engine compartment and connect to ABS wiring harness by means of the 2-pin plug connector.
- Fully test the ABS with the tester.



1=O-ring
2=Housing
3=Wheel-speed sensor edge

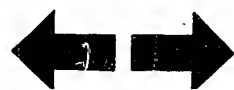
1=Wheel-speed sensor
2=Hexagon-socket-head
cap screw



G 16

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



G 17

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi

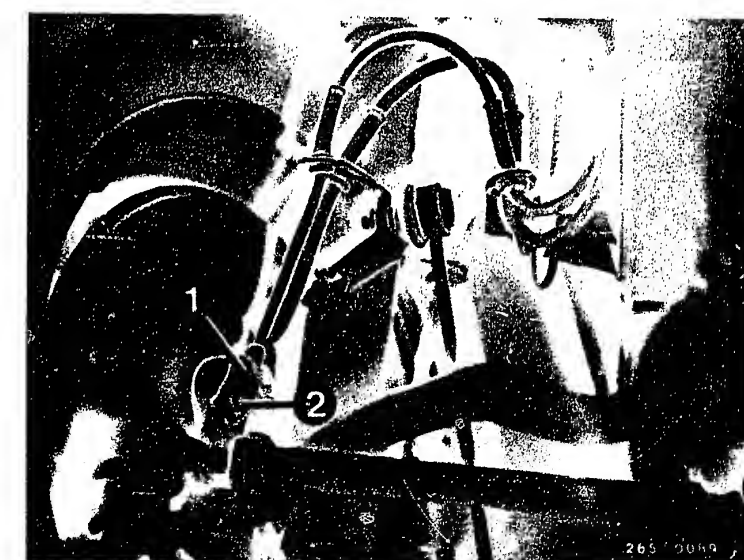


TEST STEP 31			
Operation:		Reading:	Testing:
Program-selector switch position	23	Digital display unit must indicate <u>1.2 ... 19</u>	Component: <u>Wheel-speed sensor front right</u>
<u>Additional operations:</u> <ul style="list-style-type: none"> • Drive front wheels of vehicle onto dynamic brake analyzer • Pull on the handbrake. <u>Caution:</u> In vehicles with automatic transmission make sure that selector lever is not in parking position (P). <ul style="list-style-type: none"> • Switch on the ignition. • Select wheel FR with key FR. • Switch on <u>right-hand brake roller</u> only. • Make reading. 		In case of fluctuating readings, the lowest reading is valid. <u>Note:</u> If reading is 1.2, check air gap. If reading OK, continue testing with next test step.	<u>Operation:</u> Signal and mixing up of connecting cables
			<u>Malfunction:</u> Reading less than 1.2 or greater than 19



Arrow = Wheel-speed sensor plug connector in engine compartment

1 = Wheel-speed sensor
2 = Hexagon-socket-head cap screw



Trouble-shooting: (switch off ignition)

A reading of 999 signifies:

- Speed of dynamic brake analyzer too great (above approx. 13 km/h)

Continued on G 20/G 21

G 18

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



G 19

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 31 (continued)

Reading of 0 or less than 1.2

- Be sure to remedy fault before continuing testing with the program switch in position 20, 21 and 22.
- Wheel-speed sensors reversed? Check assignment: Wheel-speed sensors must correspond to the specified wheel and controller input. If necessary, compare with circuit diagram.
- Air gap between wheel-speed sensor and ring gear too great. Check installation.
- Check wheel-bearing play.
- Replace wheel-speed sensor.

Remove wheel-speed sensors on front axle

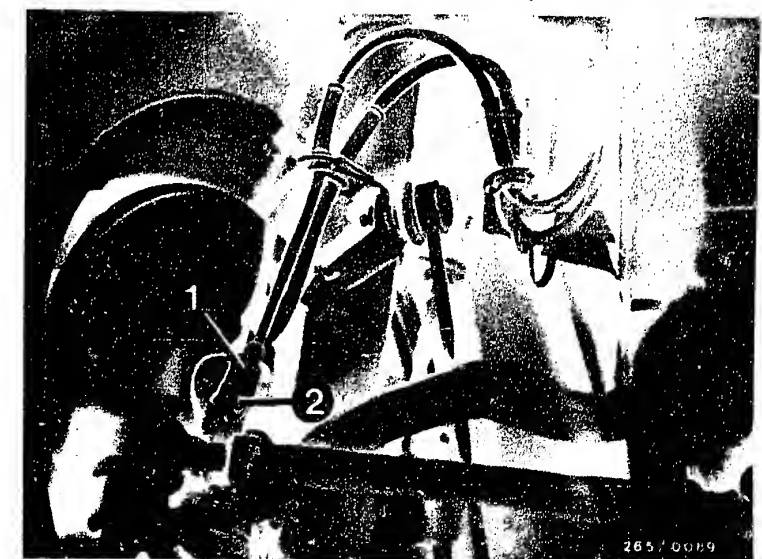
- Installation positions of plug connectors:
In engine compartment on left and right on firewall.
- Undo plug connector (arrow).
- Loosen cable mountings.
- Loosen fastening screw (2) and pull out wheel-speed sensor. Do not use force.

Continued on G 22/G 23



Arrow = Wheel-speed sensor plug connector in engine compartment

1 = Wheel-speed sensor
2 = Hexagon-socket-head cap screw



G20

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



G21

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 31 (continued)

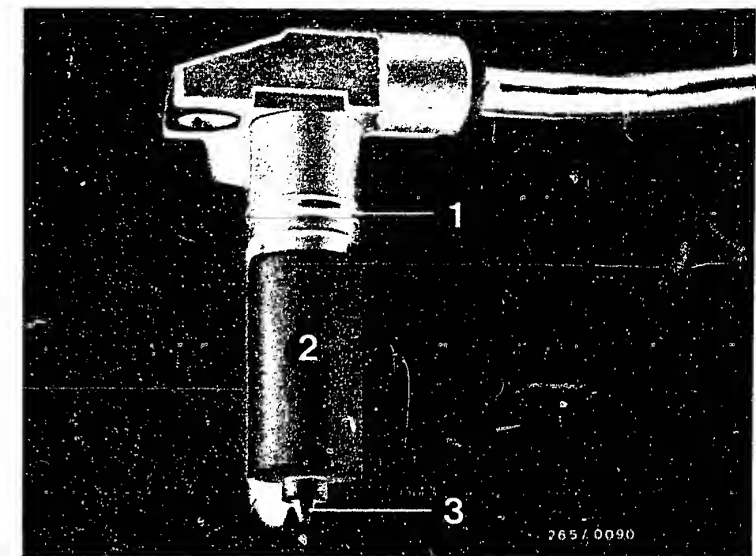
Installing wheel-speed sensors on front axle

- Test O-ring (1) for cracks and replace if necessary.
- Grease wheel-speed sensor housing with Molykote Longterm 2.

Caution!

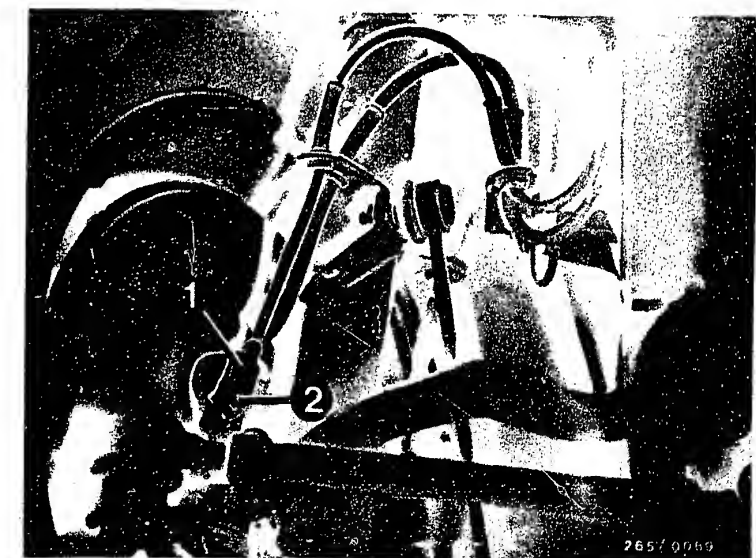
Before installing the wheel-speed sensors, make sure that there are no metallic foreign bodies on the permanently magnetic edges.

- Press wheel-speed sensor into mounting hole. Do not hit.
- Secure wheel-speed sensor with hexagon-socket-head cap screw.
- Pull cable up into engine compartment and connect to ABS wiring harness by means of the 2-pin plug connector.
- Fully test the ABS with the tester.



1=O-ring
2=Housing
3=Wheel-speed sensor edge

1=Wheel-speed sensor
2=Hexagon-socket-head
cap screw



G22

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



G23

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 32 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

20

Additional operations:

- Let the engine run.
- Select test step 20 and select wheel FL with key FL
- Switch on Left-hand brake roller.
- Press brake pedal until the braking force reading on the dynamic brake analyzer is 2000 N (200 kgf).
- Press illuminated key.
- There must be a pressure reduction on the corresponding wheel (front left).
- Release the brake pedal and illuminated key (keep to the sequence of operations so that vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Left-hand reading drops to a value

below 950 N (95 kgf)

If reading OK, continue testing with next test step.

Trouble-shooting:

- Lamp 2 (red) must not light up.
- Repeat test.
- Brake lines mixed up on hydraulic modulator? Follow markings.
- Check assignment of brake roller to keys FR and FL once again.

Testing:

Component:

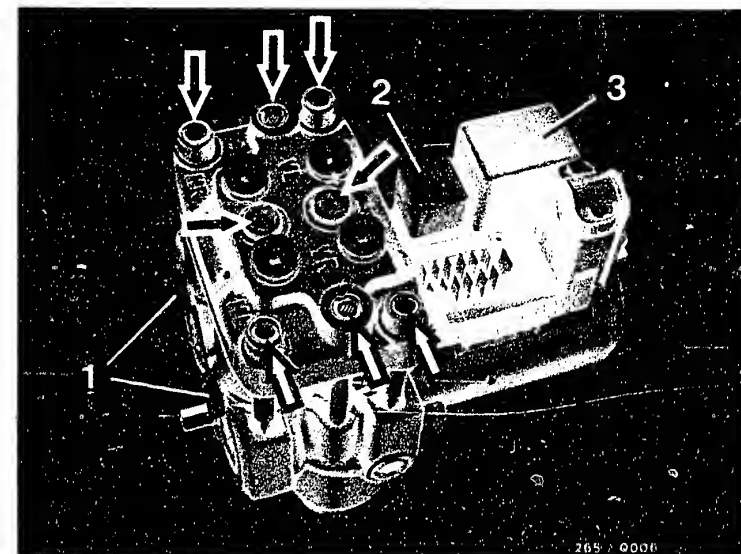
Hydraulic modulator, front axle

Operation:

Mixing up of brake lines

Malfunction:

Reading does not drop.



- 1 = Connection points for brake lines to brake master cylinder
- 2 = Valve relay
- 3 = Return-pump relay
- VL = Connection for brake line front left (wheel brake cyl.)
- VR = Connection for brake line front right (wheel brake cyl.)
- HR = Connection for brake line rear right (wheel brake cyl.)
- HL = Connection for brake line rear left (wheel brake cyl.)

Caution!

Under no circumstances may the hexagon-socket-head cap screws (arrows) be loosened. After loosening, it is no longer possible to get the brake circuits leak-tight.

Danger!

H1

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



H2

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 33 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

20

Reading:

Instruments on dynamic brake analyzer:

Right-hand reading drops to a value

below 950 N (95 kgf)

If reading OK, continue testing with next test step.

Testing:

Component:

Hydraulic modulator, front axle

Operation:

Mixing up of brake lines

Malfunction:

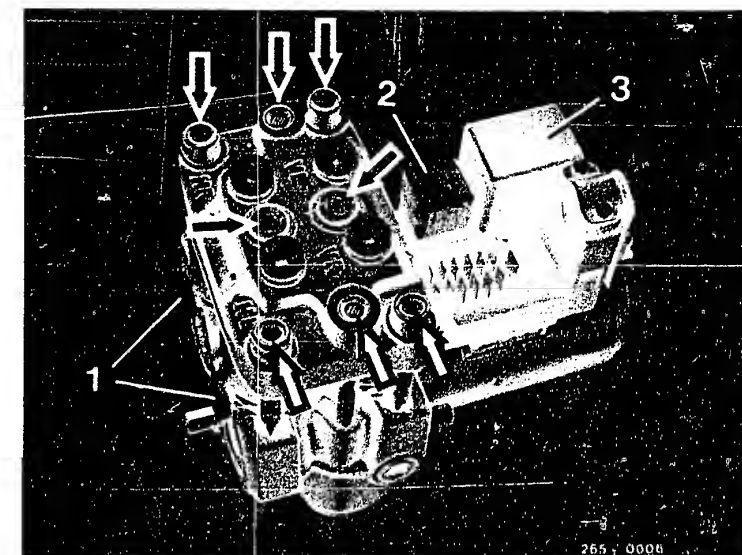
Reading does not drop.

Trouble-shooting:

- Lamp 2 (red) must not light up.
- Repeat test.
- Brake lines mixed up on hydraulic modulator? Follow markings.
- Check assignment of brake roller to keys FR and FL once again.

Additional operations:

- Let the engine run.
- Switch off left-hand brake roller.
- Switch on right-hand brake roller.
- Select wheel FR with key FR.
- Using brake pedal, produce braking force of 2000 N (200 kgf).
- Press illuminated key.
- There must be a pressure reduction on the corresponding wheel (front right).
- Release brake pedal and illuminated key.
(Follow the sequence of operations so that the vehicle does not jump out of the rollers).



- 1 = Connection points for brake lines to brake master cylinder
- 2 = Valve relay
- 3 = Return-pump relay
- VL= Connection for brake line front left (wheel brake cyl.)
- VR= Connection for brake line front right (wheel brake cyl.)
- HR= Connection for brake line rear right (wheel brake cyl.)
- HL= Connection for brake line rear left (wheel brake cyl.)

Caution!

Under no circumstances may the hexagon-socket-head cap screws (arrows) be loosened. After loosening, it is no longer possible to get the brake circuits leak-tight.

Danger!

H3

Test with ABS tester

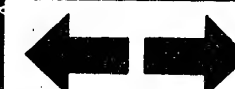
BMW 628 CSi, 633 CSi, 635 CSi



H4

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 34 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

20

Additional operations:

- Let the engine run.
- Switch on left-hand and right-hand brake rollers.
- Select wheel FL with key FL.
- Depress brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the left-hand side.
- Brake pedal force must not be changed throughout the entire testing procedure.
- Right-hand reading may differ by no more than 500 N (50 kgf) from the left-hand reading.
- Press illuminated key until test is completed (approx. 10 seconds).
- Read off left-hand reading.
- Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Left-hand reading drops to a value

below 950 N (95 kgf)

If reading OK, continue testing with next test step.

Testing:

Component:

Hydraulic modulator

Operation:

Pressure reduction in brake lines front left.

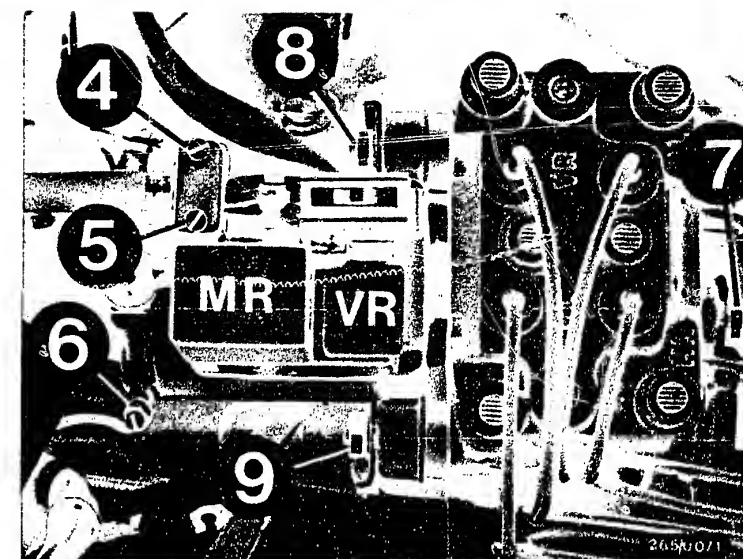
Malfunction:

Braking force reading greater than 950 N

Trouble-shooting:

- Lamp 2 (red) must not light up.
- Repeat the test twice and make sure that the braking force is not changed during the testing procedure.

Continued on H 7



- 4,5= Screws for wiring harness strain relief
 6 = Ground terminal for pump motor
 7,8,9=Mounting points for hydraulic modulator
 MR = Return-pump relay
 VR = Valve relay

H5

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



H6

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 34

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.

H7

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 35 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

20

Additional operations:

- Let the engine run.
- Select wheel FR with key FR.
- Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the right-hand side.
- Brake pedal force must not be changed throughout the entire testing procedure.
- Left-hand reading may differ by no more than 500 N (50 kgf) from the right-hand reading.
- Press illuminated key until test is completed (approx. 10 seconds).
- Read off right-hand reading.
- Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Right-hand reading drops to a value

below 950 N (95 kgf)

If reading OK, continue testing with next test step.

Testing:

Component:

Hydraulic modulator

Operation:

Pressure reduction in brake lines front right

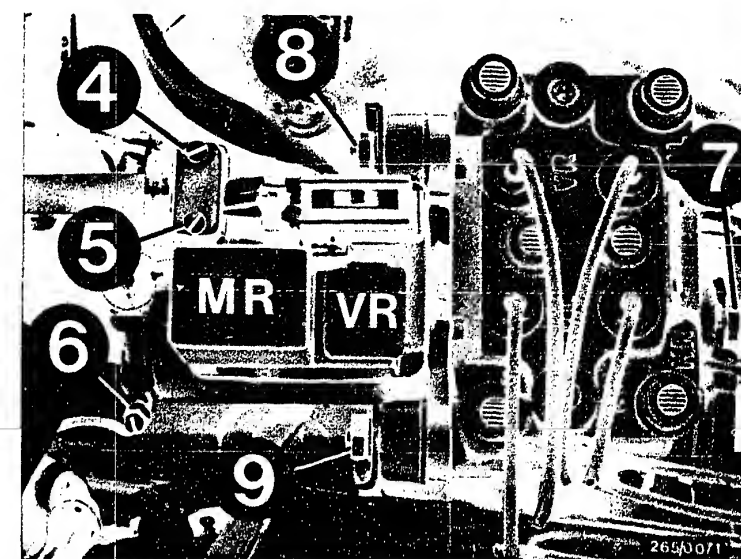
Malfunction:

Braking force reading greater than 950 N

Trouble-shooting:

- Lamp 2 (red) must not light up.
- Repeat the test twice and make sure that the braking force is not changed during the testing procedure (let the engine run).

Continued on H 10



- 4,5= Screws for wiring harness strain relief
 6 = Ground terminal for pump motor
 7,8,9=Mounting points for hydraulic modulator
 MR = Return-pump relay
 VR = Valve relay

H8

Test with ABS tester
 BMW 628 CSi, 633 CSi, 635 CSi



H9

Test with ABS tester
 BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 35

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.



TEST STEP 36 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

21

Additional operations:

- Let the engine run.
- Switch on both brake rollers.
- Select wheel FL with key FL.
- Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the left-hand side.
- Brake pedal force must not be changed throughout the entire testing procedure.
- Press illuminated key continuously until test is completed (approx. 5 seconds)
- Read off left-hand reading.
- Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Left-hand reading drops to a value of

650 ... 1400 N
(65 ... 140 kgf)

If reading OK, continue testing with next test step.

Testing:

Component:

Hydraulic modulator

Operation:

Pressure buildup in brake lines front left

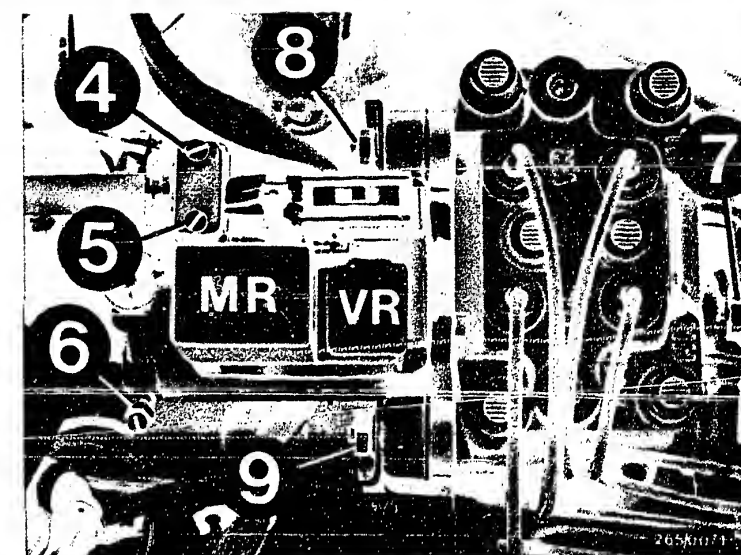
Malfunction:

Braking force reading less than 650 N or greater than 1400 N

Trouble-shooting:

- Repeat the test twice and make sure that the braking force is not changed during the testing procedure (let the engine run).

Continued on H 13



- 4,5= Screws for wiring harness strain relief
- 6 = Ground terminal for pump motor
- 7,8,9=Mounting points for hydraulic modulator
- MR = Return-pump relay
- VR = Valve relay

H11

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



H12

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 36

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.



TEST STEP 37 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

21

Reading:

Instruments on dynamic brake analyzer:

Right-hand reading drops to a value of

650 ... 1400 N
(65 ... 140 kgf)

If reading OK, continue testing with next test step.

Testing:

Component:

Hydraulic modulator

Operation:

Pressure buildup in brake lines front right

Malfunction:

Braking force reading less than 650 N or greater than 1400 N

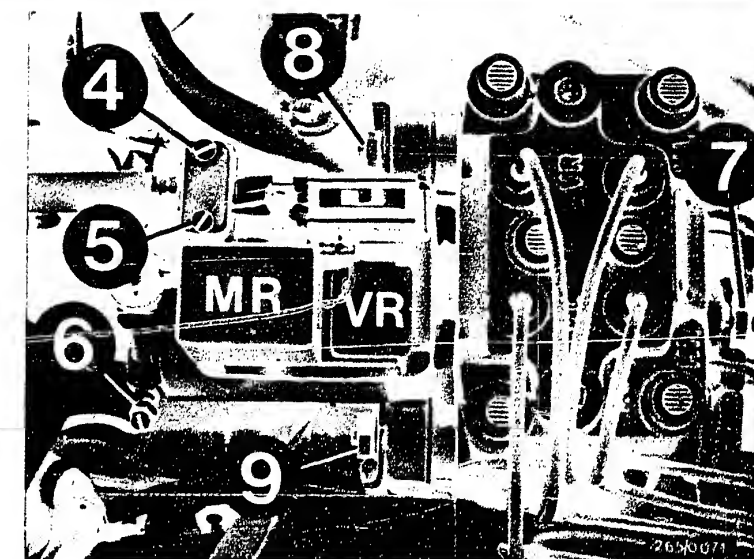
Additional operations:

- Let the engine run.
- Select wheel FR with key FR.
- Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the right-hand side.
- Brake pedal force must not be changed throughout the entire testing procedure.
- Press illuminated key continuously until test is completed (approx. 5 seconds)
- Read off right-hand reading.
- Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers).

Trouble-shooting:

- Repeat the test twice and make sure that the braking force is not changed during the testing procedure (let the engine run).

Continued on H 16



- 4,5= Screws for wiring harness strain relief
- 6 = Ground terminal for pump motor
- 7,8,9=Mounting points for hydraulic modulator
- MR = Return-pump relay
- VR = Valve relay

H14

Test with ABS tester

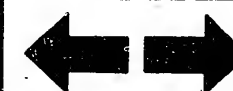
BMW 628 CSi, 633 CSi, 635 CSi



H15

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



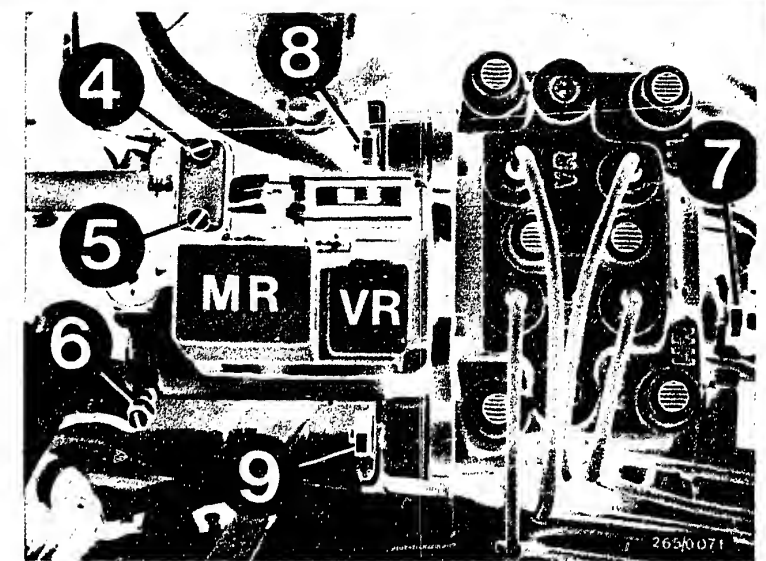
TEST STEP 37

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.



TEST STEP 38 (perform only if engine-speed sensor O.K.)			
Operation:		Reading:	Testing:
Program-selector switch position	22	Instruments on dynamic brake analyzer:	Component: Hydraulic modulator
<u>Additional operations:</u> <ul style="list-style-type: none"> Let the engine run. Switch on both brake rollers. Select wheel FL with key FL. Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the <u>left-hand side</u>. Brake pedal force must not be changed throughout the entire testing procedure. Press illuminated key continuously until test is completed (approx. 5 seconds). Do not release illuminated key while testing. Read off left-hand reading. Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers). 		After 2 pressure reductions without return pump, the return pump is switched on briefly. Then left-hand braking-force reading must drop briefly (approx. 2.5 s) <u>below 400 N (40 kgf)</u> . Brake pedal comes back slightly when pump switches on. Press illuminated key (approx. 5 seconds) until braking force rises again. (Test completed).	<u>Operation:</u> Pump delivery Brake circuit 1
		If reading OK, <u>continue testing with next test step</u> .	<u>Malfunction:</u> Braking force reading greater than 400 N



- 4,5= Screws for wiring harness strain relief
 6 = Ground terminal for pump motor
 7,8,9=Mounting points for hydraulic modulator
 MR = Return-pump relay
 VR = Valve relay

Trouble-shooting:

- Repeat test twice and make sure that the braking force is not changed during the testing procedure (let the engine run).

Continued on H 19

H17

Test with test adapter

BMW 628 CSi, 633 CSi, 635 CSi



H18

Test with test adapter

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 38

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.



TEST STEP 39 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

22

Additional operations:

- Let the engine run.
- Select wheel FR with key FR.
- Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the right-hand side.
- Brake pedal force must not be changed throughout the entire testing procedure.
- Press illuminated key continuously until test is completed (approx. 5 seconds).
- Read off right-hand reading.
- Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

After 2 pressure reductions without return pump, the return pump is switched on briefly.

The right-hand braking force reading must drop briefly (approx. 2.5 s)

below 400 N (40 kgf).

Brake pedal comes back slightly when pump switches on.

Press illuminated key (approx. 5 seconds) until braking force rises again. (Test completed).

If reading OK, continue testing with next test step.

Testing:

Component:

Hydraulic modulator

Operation:

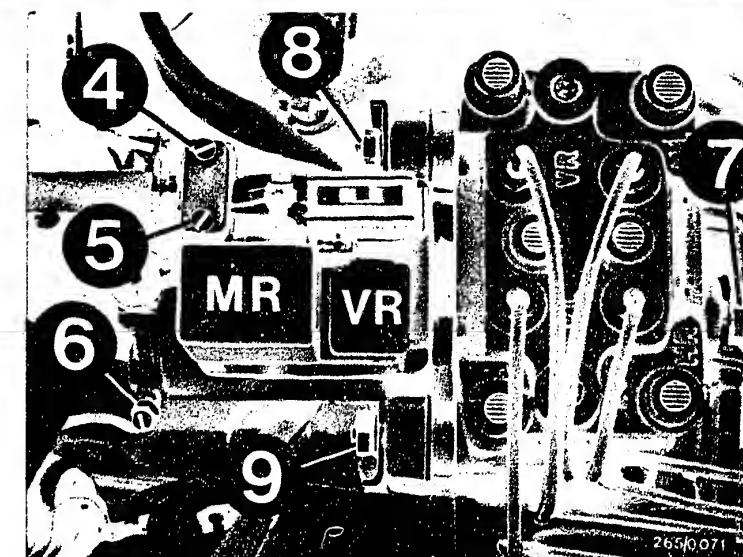
Pump delivery
Brake circuit 2

Malfunction:

Braking force reading greater than 400 N

Trouble-shooting:

- Repeat test twice and make sure that the braking force is not changed during the testing procedure (let the engine run).



- 4 = Screws for wiring harness strain relief
- 6 = Ground terminal for pump motor
- 7, 8, 9 = Mounting points for hydraulic modulator
- MR = Return-pump relay
- VR = Valve relay

Continued on H 22

H20

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



H21

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 39

Trouble-shooting (continued)

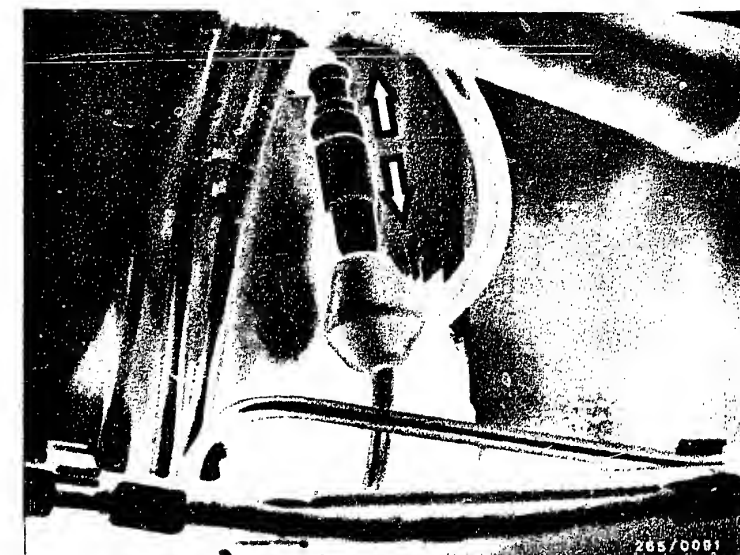
- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.



Rear axle - Carry out program-selector switch position 23 first since it is assumed for the following test steps that the wheel-speed sensors are in proper working order. Otherwise, the brake master cylinder may possibly be destroyed.

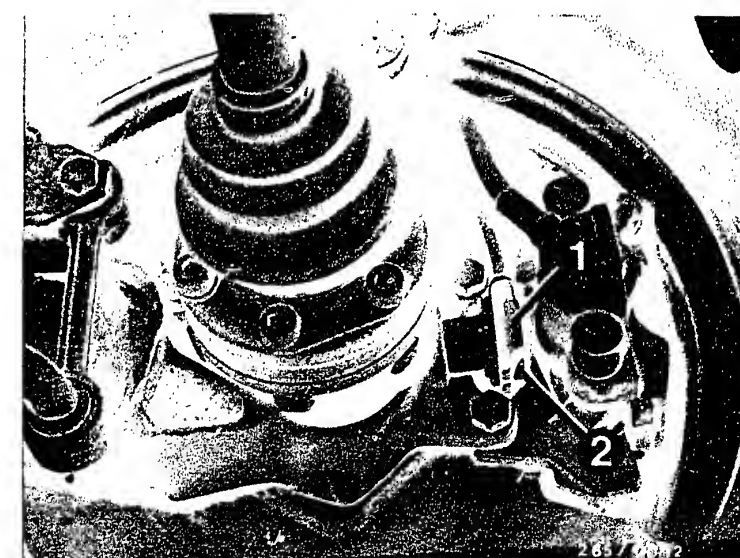
TEST STEP 40

<u>Operation:</u>		<u>Reading:</u>	<u>Testing:</u>
Program-selector switch position	23	Digital display unit must indicate <u>1.2...19 V</u>	<u>Component:</u> Wheel-speed sensor rear left
<u>Additional operations:</u>		In case of fluctuating readings, the lowest reading is valid.	<u>Operation:</u> Wheel-speed sensor signal
<ul style="list-style-type: none"> • Drive the rear wheels of the vehicle onto the dynamic brake analyzer. • Switch on the ignition. • Select wheel RL with key RL. • Switch on <u>left-hand brake roller</u>. • Make reading. 		<p><u>Note:</u> If reading is 1.2 V, check air gap.</p> <p>If reading OK, continue testing with <u>next test step</u>.</p>	<u>Malfunction:</u> Reading less than 1.2 or greater than 19 V.



Arrows = Wheel-speed sensor plug connector under rear seat

- 1 = Wheel-speed sensor
2 = Hexagon-socket-head cap screw



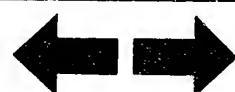
Trouble-shooting (switch off ignition):

- A reading of 999 signifies: speed of dynamic brake analyzer too great (above approx. 13 km/h)

Continued on J 3/J 4

J1

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



J2

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 40 (continued)

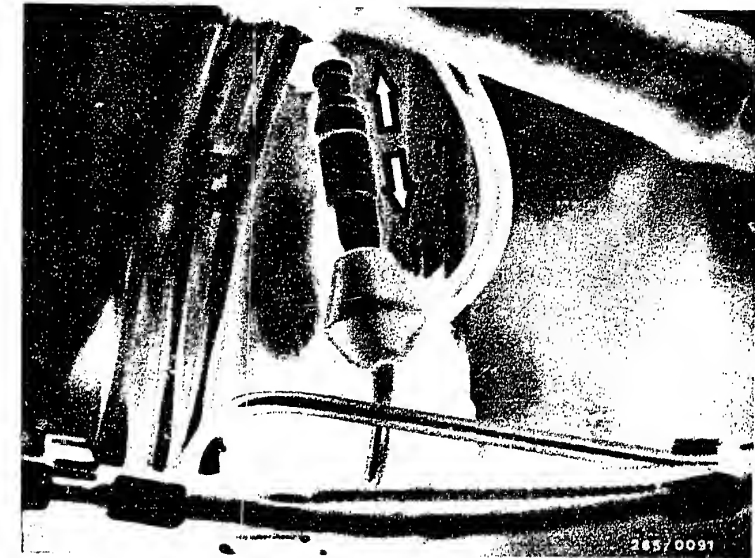
Reading of 0 or less than 1.2

- Be sure to remedy fault before continuing testing with the program switch in position 20, 21 and 22.
- Wheel-speed sensors reversed? Check assignment: Wheel-speed sensors must correspond to the specified wheel and controller input. If necessary, compare with circuit diagram.
- Air gap between wheel-speed sensor and ring gear too great. Check installation.
- Check wheel-bearing play.
- Replace wheel-speed sensor.

Removing wheel-speed sensors on rear axle

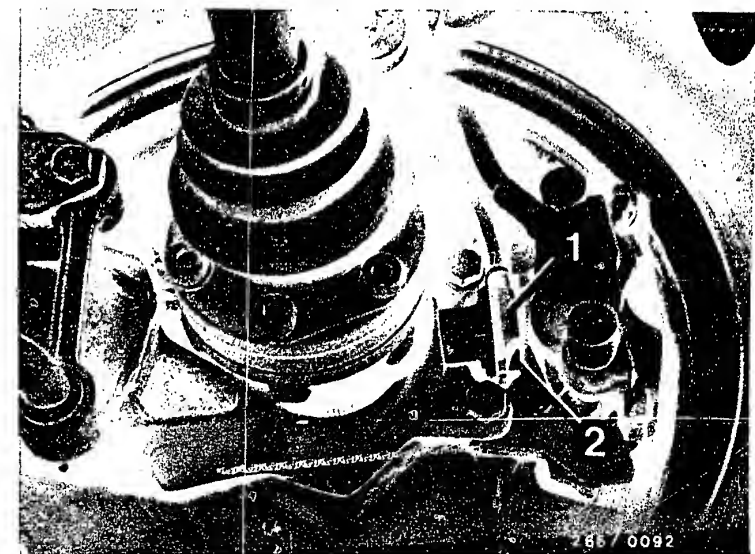
- Rear wheels can be removed to facilitate replacement of the wheel-speed sensors.
- Switch off ignition.
- Remove wheel-speed sensor cable from clamps.
- Pull out rubber sleeve and cable until plug connector can be reached. Do not damage rubber sleeve. Undo plug connector.
- Unscrew brake caliper so that wheel-speed sensor can be pulled out. Brake line remains connected.
- Loosen hexagon-socket-head cap screw (2) and pull out wheel-speed sensor (1). Do not use force.

Continued on J 5/J 6



Arrows = Wheel-speed sensor plug connector under rear seat

- 1 = Wheel-speed sensor
- 2 = Hexagon-socket-head cap screw



J3

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



J4

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 40 (continued)

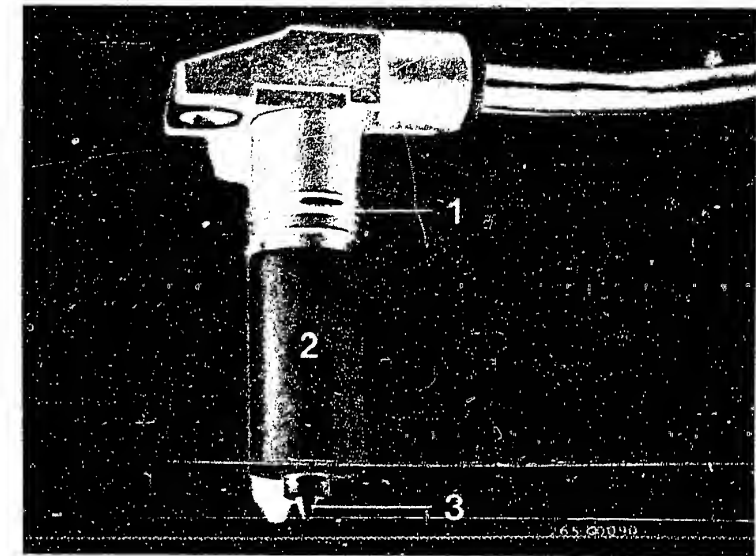
Install wheel-speed sensor on rear axle

- Test O-ring (1) for cracks and replace if necessary.
- Grease wheel-speed sensor housing with Molykote Longterm 2.

Caution!

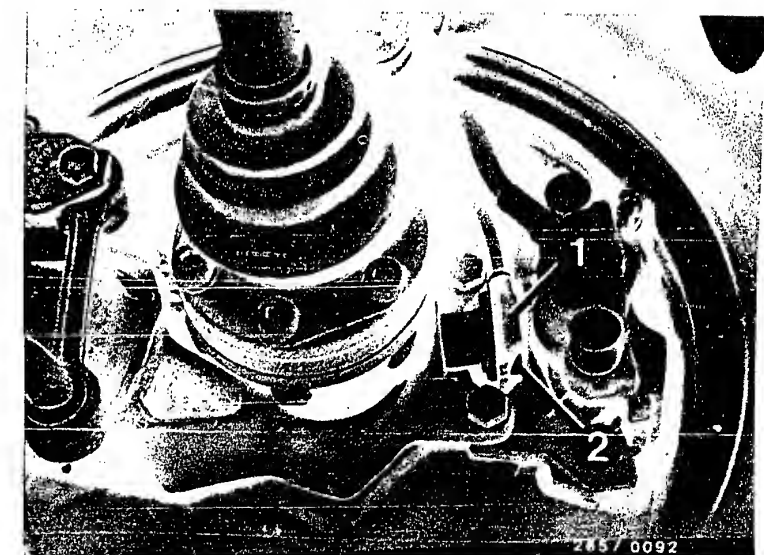
Before installing the wheel-speed sensors, make sure that there are no metallic foreign bodies on the permanently magnetic edges.

- Press wheel-speed sensor into mounting hole. Do not hit. Do not damage O-ring.
- Secure wheel-speed sensor with hexagon-socket-head cap screw.
- Connect wheel-speed sensor to wiring harness and fit plug connector with rubber sleeve into bore.
- Press cable into clamps.
- Screw on brake valve and mount rear wheel.
- Fully test ABS with tester.



1=O-ring
2=Housing
3=Wheel-speed sensor edge

1=Wheel-speed sensor
2=Hexagon-socket-head cap screw



J5

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



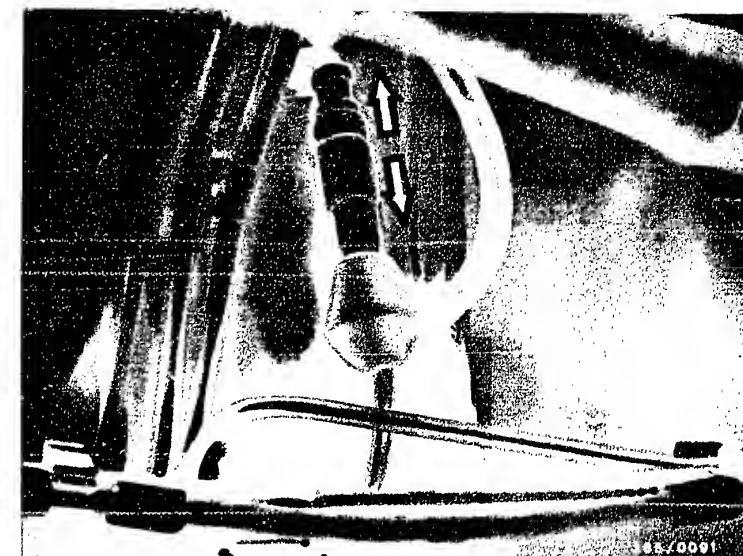
J6

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 41

Operation:		Reading:	Testing:
Program-selector switch position	23	Digital display unit must indicate <u>1.2...19 V</u>	Component: Wheel-speed sensor <u>rear right</u>
<u>Additional operations:</u> <ul style="list-style-type: none"> • Drive the rear wheels of the vehicle onto the dynamic brake analyzer. • Switch on the ignition. • Select wheel RR with key RR. • Switch on <u>right-hand brake roller only</u>. • Make reading. 		In case of fluctuating readings, the lowest reading is valid.	Operation: Signal and mixing up of connecting cables
		Note: If reading is 1.2 V, check air gap.	Malfunction: Reading less than 1,2 or greater than 19 V.
		If reading OK, continue testing with next test step.	



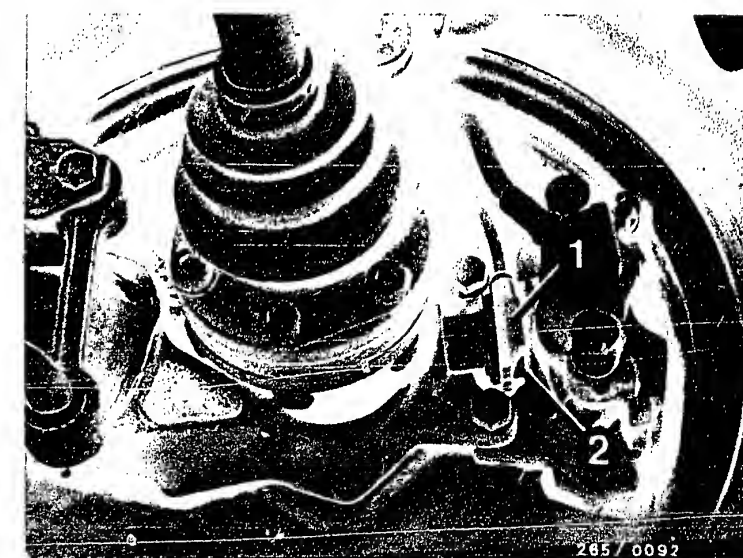
Arrows = Wheel-speed sensor plug connector under rear seat

1=Wheel-speed sensor
2=Hexagon-socket-head cap screw

Trouble-shooting (switch off ignition):

- A reading of 999 signifies: speed of dynamic brake analyzer too great (above approx. 13 km/h)

Continued on J 9/J 10



J7

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



J8

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 41 (continued)

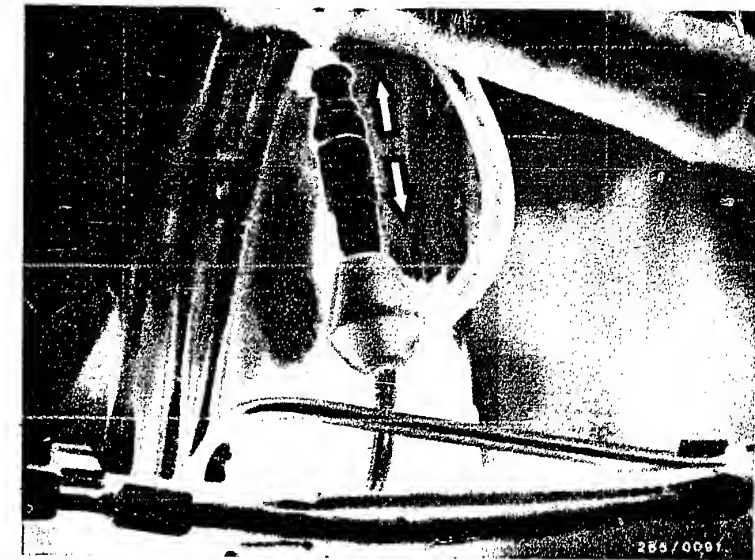
Reading of 0 or less than 1.2

- Be sure to remedy fault before continuing testing with the program switch in position 20, 21 and 22.
- Wheel-speed sensors reversed? Check assignment: Wheel-speed sensors must correspond to the specified wheel and controller input. If necessary, compare with circuit diagram.
- Air gap between wheel-speed sensor and ring gear too great. Check installation.
- Check wheel-bearing play.
- Replace wheel-speed sensor.

Removing wheel-speed sensors on rear axle

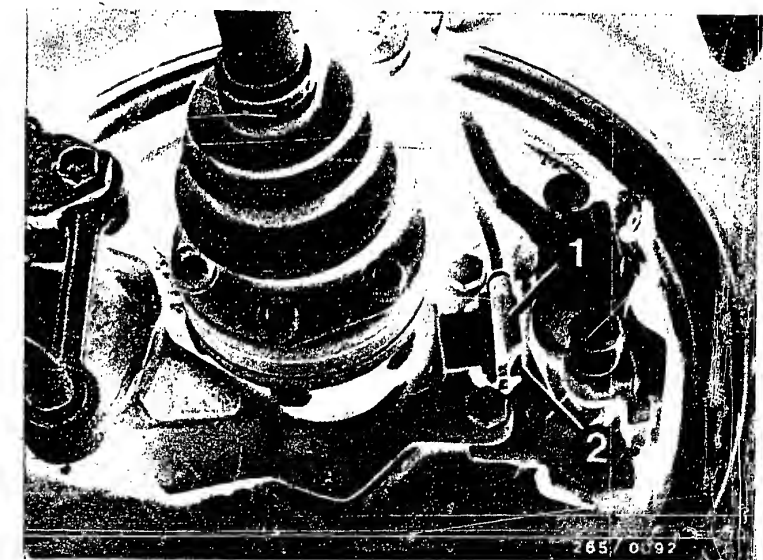
- Rear wheels can be removed to facilitate replacement of the wheel-speed sensors.
- Switch off ignition.
- Remove wheel-speed sensor cable from clamps.
- Pull out rubber sleeve and cable until plug connector can be reached. Do not damage rubber sleeve. Undo plug connector.
- Unscrew brake caliper so that wheel-speed sensor can be pulled out. Brake line remains connected.
- Loosen hexagon-socket-head cap screw (2) and pull out wheel-speed sensor (1). Do not use force.

Continued on J 11/J 12



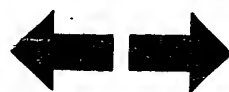
Arrows = Wheel-speed sensor plug connector under rear seat

- 1 = Wheel-speed sensor
- 2 = Hexagon-socket-head cap screw



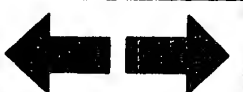
J9

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



J10

Test with ABS tester
BMW 628 CSi, 633 CSi, 635 CSi



Trouble-shooting for TEST STEP 41 (continued)

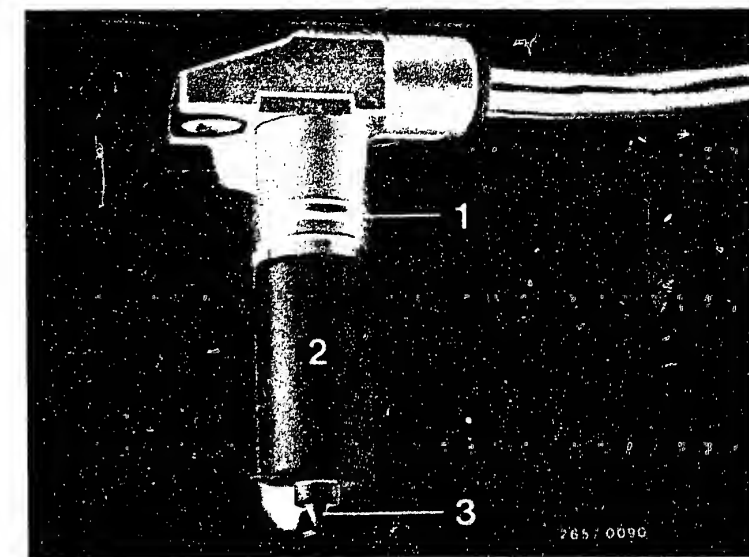
Install wheel-speed sensor on rear axle

- Test O-ring (1) for cracks and replace if necessary.
- Grease wheel-speed sensor housing with Molykote Longterm 2.

Caution!

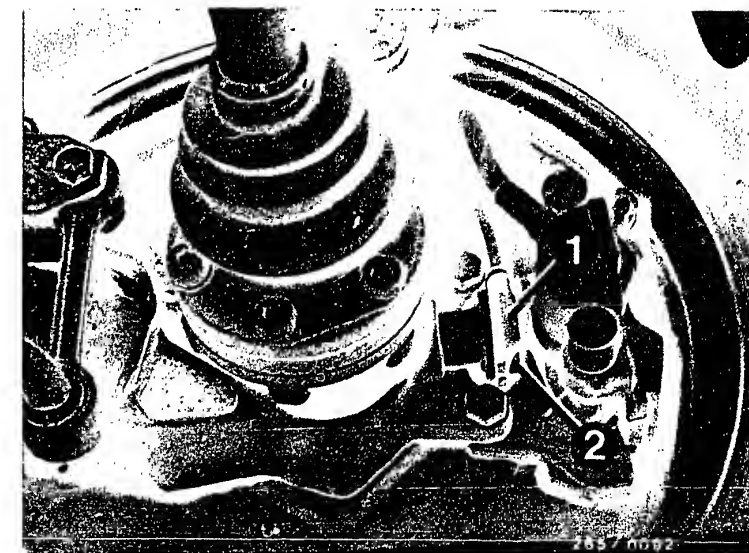
Before installing the wheel-speed sensors, make sure that there are no metallic foreign bodies on the permanently magnetic edges.

- Press wheel-speed sensor into mounting hole. Do not hit. Do not damage O-ring.
- Secure wheel-speed sensor with hexagon-socket-head cap screw.
- Connect wheel-speed sensor to wiring harness and fit plug connector with rubber sleeve into bore.
- Press cable into clamps.
- Screw on brake caliper and mount rear wheel.
- Fully test ABS with tester.



1=O-ring
2=Housing
3=Wheel-speed sensor edge

1=Wheel-speed sensor
2=Hexagon-socket-head
cap screw



J11

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



J12

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 42 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

20

Additional operations:

- Let the engine run.
- Select test step 20, and select wheel RL with key RL.
- Switch on Left-hand brake roller.
- Using brake pedal, produce a braking force of 2000 N (200 kgf).
- Press illuminated key.
- There must be a pressure reduction on the corresponding wheel (rear left).
- Release brake pedal and illuminated key.
(Follow the sequence of operations so that the vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Left-hand reading moves to a value

below 1000 N (100 kgf)

If reading OK, continue testing with next test step.

Trouble-shooting:

- Lamp 2 (red) must not light up.
- Repeat test.
- Brake lines mixed up on hydraulic modulator? Follow markings.
- Check assignment of brake roller to keys RR and RL once again.

Testing:

Component:

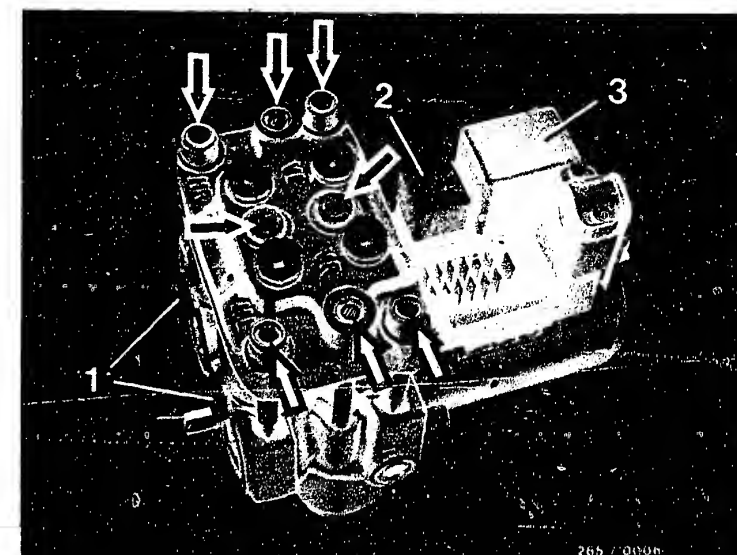
Hydraulic modulator, rear axle

Operation:

Mixing up of brake lines

Malfunction:

Reading does not drop



- 1 = Connection points for brake lines to brake master cylinder
- 2 = Valve relay
- 3 = Return-pump relay
- VL= Connection for brake line front left (wheel brake cyl.)
- VR= Connection for brake line front right (wheel brake cyl.)
- HR= Connection for brake line rear right (wheel brake cyl.)
- HL= Connection for brake line rear left (wheel brake cyl.)

Caution!

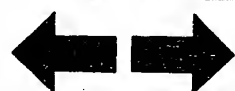
Under no circumstances may the hexagon-socket-head cap screws (arrows) be loosened. After loosening, it is no longer possible to get the brake circuits leak-tight.

Danger!

J13

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



J14

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 43 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

20

Additional operations:

- Let the engine run.
- Switch off left-hand brake roller.
- Switch on right-hand brake roller.
- Select wheel RR with key RR.
- Using brake pedal, produce a braking force of 2000 N (200 kgf).
- Press illuminated key.
- There must be a pressure reduction on the corresponding wheel (front right).
- Release brake pedal and illuminated key. (Follow the sequence of operations so that the vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Right-hand reading moves to a value

below 1000 N (100 kgf)

If reading OK, continue testing with next test step.

Testing:

Component:

Hydraulic modulator, rear axle

Operation:

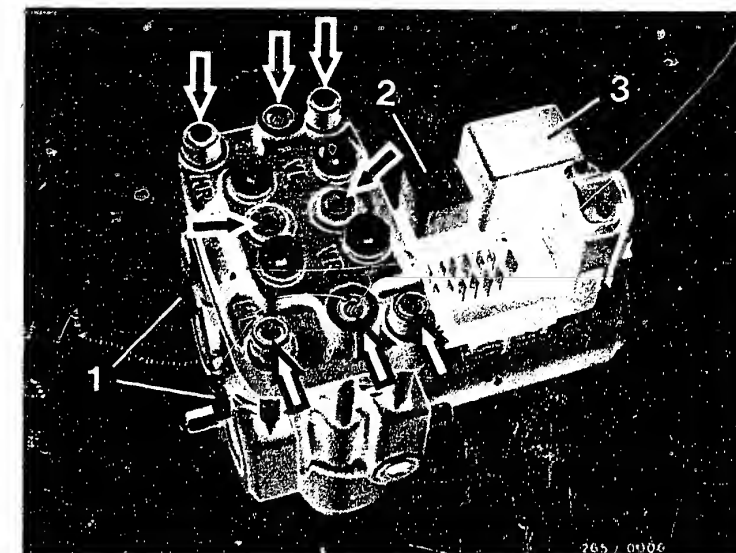
Mixing up of brake lines

Malfunction:

Reading does not drop

Trouble-shooting:

- Lamp 2 (red) must not light up.
- Repeat test.
- Brake lines mixed up on hydraulic modulator? Follow markings.
- Check assignment of brake roller to keys RR and RL once again.



- 1 = Connection points for brake lines to brake master cylinder
- 2 = Valve relay
- 3 = Return-pump relay
- VL= Connection for brake line front left (wheel brake cyl.)
- VR= Connection for brake line front right (wheel brake cyl.)
- HR= Connection for brake line rear right (wheel brake cyl.)
- HL= Connection for brake line rear left (wheel brake cyl.)

Caution!

Under no circumstances may the hexagon-socket-head cap screws (arrows) be loosened. After loosening, it is no longer possible to get the brake circuits leak-tight.

Danger!

J15

Test with ABS tester

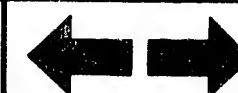
BMW 628 CSi, 633 CSi, 635 CSi



J16

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 44 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

20

Additional operations:

- Let the engine run.
- Switch on left-hand and right-hand brake rollers.
- Select wheel RL with key RL.
- Press the brake pedal until the instrument on the dynamic brake analyzer indicates 2000 N (200 kgf) for the left-hand side.

Brake pedal force must not be changed throughout the entire measuring procedure.

- Right-hand reading may differ by no more than 500 N (50 kgf) from the left-hand reading.
- Press illuminated key until test is completed (approx. 10 seconds).
- Read off left-hand reading.
- Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Left-hand reading moves to a value

below 1000 N (100 kgf)

If reading OK, continue testing with next test step.

Testing:

Component:

Hydraulic modulator

Operation:

Pressure reduction in brake lines rear left.

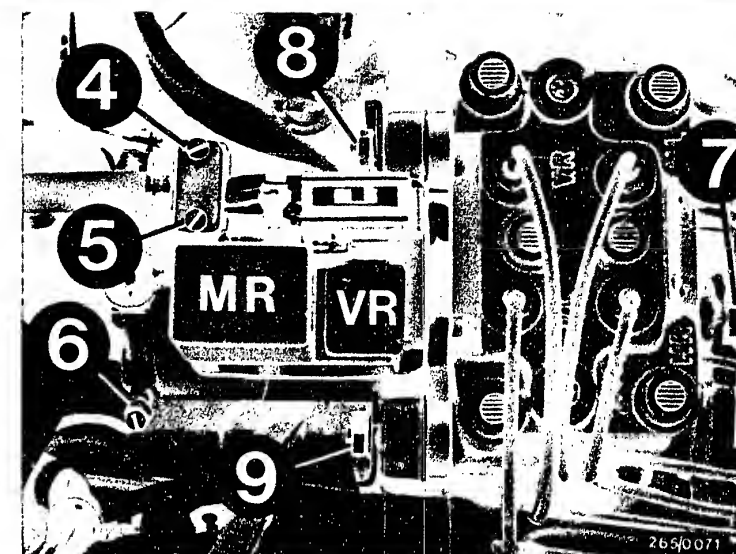
Malfunction:

Braking force reading greater than 1000 N

Trouble-shooting:

- Lamp 2 (red) must not light up.
- Repeat the test twice and make sure that the braking force is not changed during the testing procedure.

Continued on J 19



4,5= Screws for wiring harness strain relief

6 = Ground terminal for pump motor

7,8,9=Mounting points for hydraulic modulator

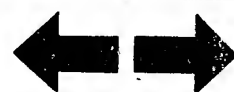
MR = Return-pump relay

VR = Valve relay

J17

Test with ABS tester

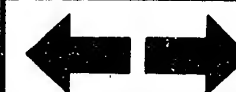
BMW 628 CSi, 633 CSi, 635 CSi



J18

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 44

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.



TEST STEP 45 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

20

Additional operations:

- Let the engine run.
- Select wheel RR with key RR.
- Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the right-hand side.
- Brake pedal force must not be changed throughout the entire testing procedure.
- Left-hand reading may differ by no more than 500 N (50 kgf) from the right-hand reading.
- Press illuminated key until test is completed (approx. 10 seconds).
- Read off right-hand reading.
- Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Right-hand reading moves to a value

below 1000 N (100 kgf)

If reading OK, continue testing with next test step.

Testing:

Component:

Hydraulic modulator

Operation:

Pressure reduction in brake lines rear right.

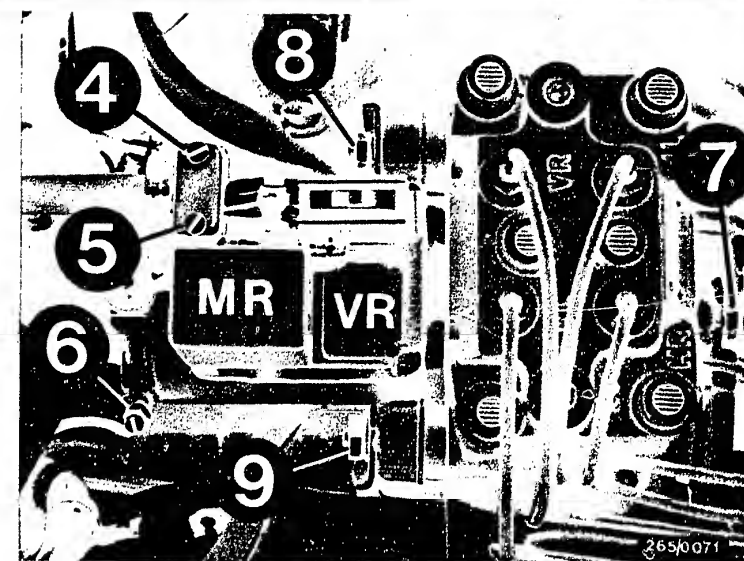
Malfunction:

Braking force reading greater than 1000 N.

Trouble-shooting:

- Lamp 2 (red) must not light up.
- Repeat the test twice and make sure that the braking force is not changed during the testing procedure (let the engine run).

Continued on J 22



- 4,5= Screws for wiring harness strain relief
 6 = Ground terminal for pump motor
 7,8,9=Mounting points for hydraulic modulator
 MR = Return-pump relay
 VR = Valve relay

J20

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



J21

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 45

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.



TEST STEP 46 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

21

Additional operations:

- Let the engine run.
- Switch on both brake rollers.
- Select wheel RL with key RL.
- Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the left-hand side.
- Brake pedal force must not be changed throughout the entire testing procedure.
- Press illuminated key continuously until test is completed (approx. 5 seconds)
- Read off left-hand reading.
- Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Left-hand reading moves to a value of

500 ... 1200 N
(50 ... 120 kgf)

If reading OK, continue testing with next test step.

Testing:

Component:

Hydraulic modulator

Operation:

Pressure buildup in brake lines rear left.

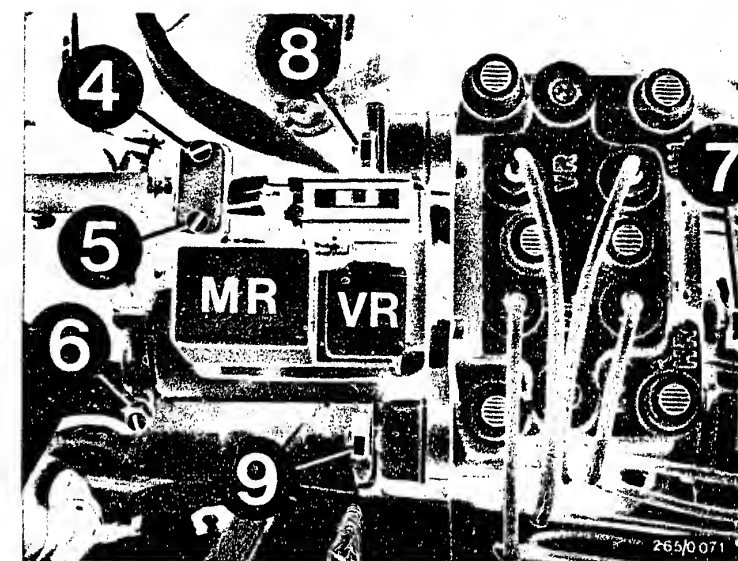
Malfunction:

Braking force reading less than 500 N or greater than 1200 N

Trouble-shooting:

- Repeat the test twice and make sure that the braking force is not changed during the testing procedure (let the engine run).

Continued on K 3



- 4,5= Screws for wiring harness strain relief
6 = Ground terminal for pump motor
7,8,9=Mounting points for hydraulic modulator
MR = Return-pump relay
VR = Valve relay

K1

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



K2

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 46

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.

K3

Test with ABS tester

BMW 628 CSi, 633 CSi, 635 CSi



TEST STEP 47 (perform only if engine-speed sensor O.K.)

Operation:

Program-selector switch position

21

Reading:

Instruments on dynamic brake analyzer:

Right-hand reading moves to a value of

500 ... 1200 N
(50 ... 120 kgf)

If reading OK, continue testing with next test step.

Testing:

Component:

Hydraulic modulator

Operation:

Pressure buildup in brake lines rear right

Malfunction:

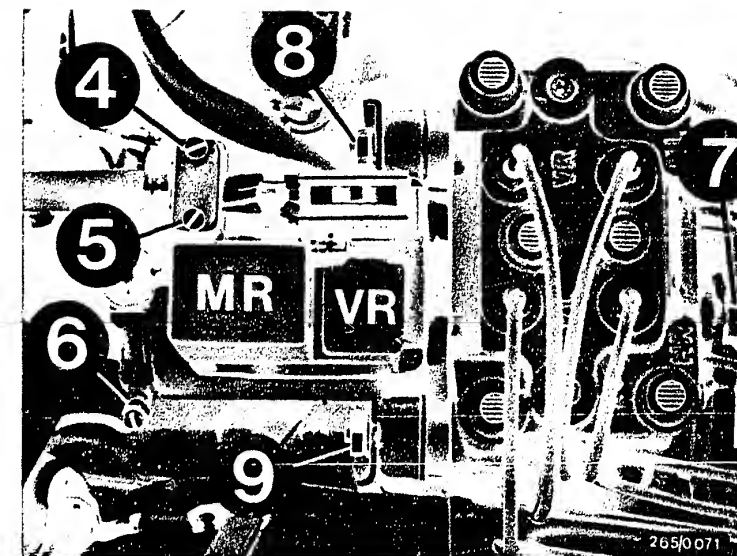
Braking force reading less than 500 N or greater than 1200 N

Additional operations:

- Let the engine run.
- Select wheel RR with key RR.
- Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the right-hand side.
- Brake pedal force must not be changed throughout the entire testing procedure.
- Press illuminated key until test is completed (approx. 5 seconds).
- Read off right-hand reading.
- Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers).

Trouble-shooting:

- Repeat the test twice and make sure that the braking force is not changed during the testing procedure (let the engine run).



- 4,5= Screws for wiring harness strain relief
6 = Ground terminal for pump motor
7,8,9=Mounting points for hydraulic modulator
MR = Return-pump relay
VR = Valve relay

K4

Test with ABS tester

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K5

Test with ABS tester

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TEST STEP 47

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.

K6

Test with ABS tester

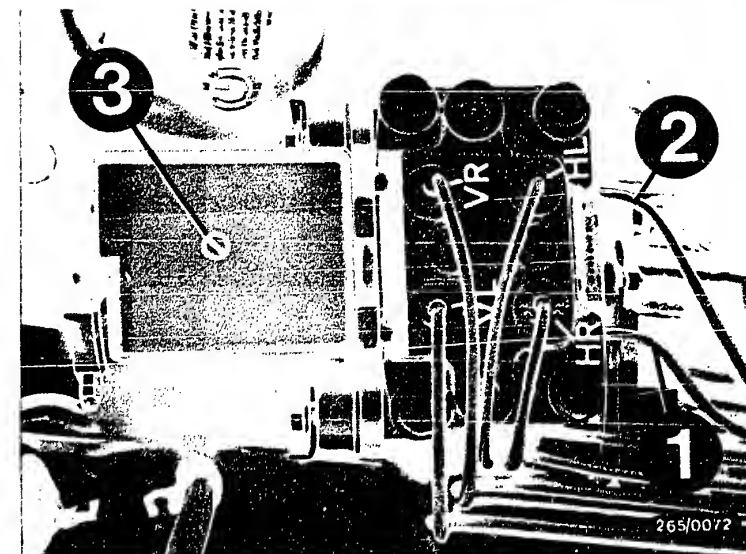
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Replacing the hydraulic modulator
(applies to test steps 32...39 and 41...47)

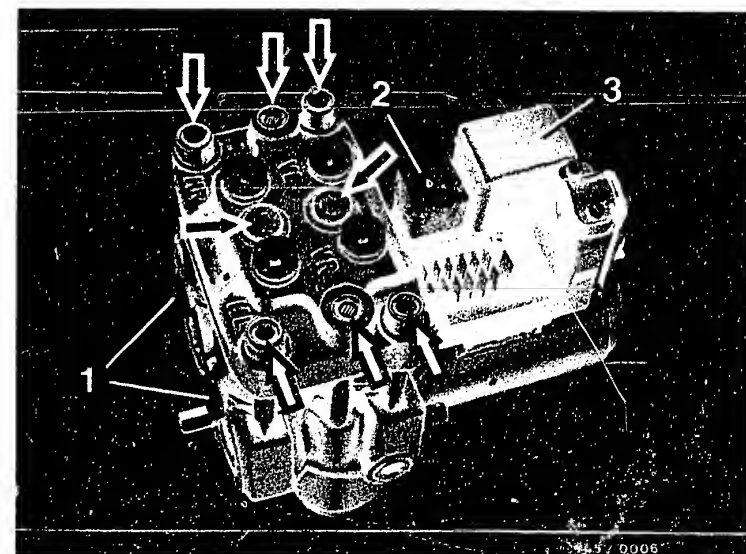
Removing the hydraulic modulator

- For safety reasons, the hydraulic modulator must not be repaired, but the complete unit must be replaced.
Exceptions to this are the return-pump relay and the valve relay. Both relays may be replaced.
- Apart from the brake-line connections, it is not permissible to loosen any screws on the hydraulic modulator. In particular the hexagon-socket-head cap screws (bottom picture - arrows) may under no circumstances be loosened. After loosening, it is no longer possible to get the brake circuits leak-tight.
Danger!
- Check the hydraulic modulator and brake-line connections for leaks by means of a visual examination. If brake fluid is escaping, tighten the brake-line connections (12...16 Nm) or replace, or replace the hydraulic modulator.



- 1 = Brake line to front brake master cylinder
2 = Brake line to rear brake master cylinder
3 = Screw for lid

- 1 = Connection points for brake lines to brake master cylinder
2 = Valve relay
3 = Return-pump relay



Continued on K 9/K 10

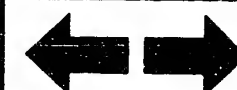
K7

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K8

Test with ABS tester
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Replacing the hydraulic modulator (continued)

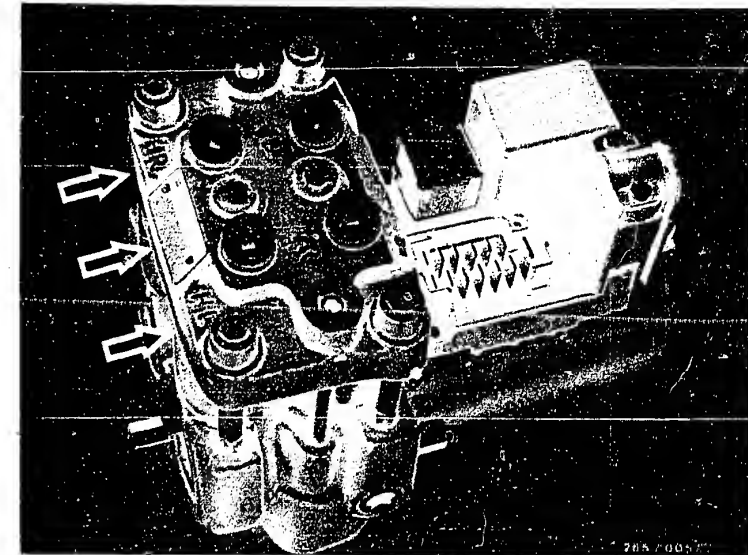
Pay particular attention to the joint identified by 3 arrows (picture). On the base of the hydraulic modulator there is a vent hole to the pump pistons. A slight escape of brake fluid is possible at this point.

A complaint is only justified if, after pressing the brake pedal several times, a pool of brake fluid is formed under the hydraulic modulator.

- When removing and installing the brake lines, make sure that the lines are marked in accordance with the markings on the hydraulic modulator and that they are not mixed up when re-connecting (e.g. FL of hydraulic modulator must be connected to the front left wheel brake cylinder).

- Markings on hydraulic modulator

VL = Connection for brake line front left (wheel brake cylinder)
VR = Connection for brake line front right (wheel brake cylinder)
HR = Connection for brake line rear right (wheel brake cylinder)
HL = Connection for brake line rear left (wheel brake cylinder)



Continued on K 11/K 12

K9

Test with ABS tester
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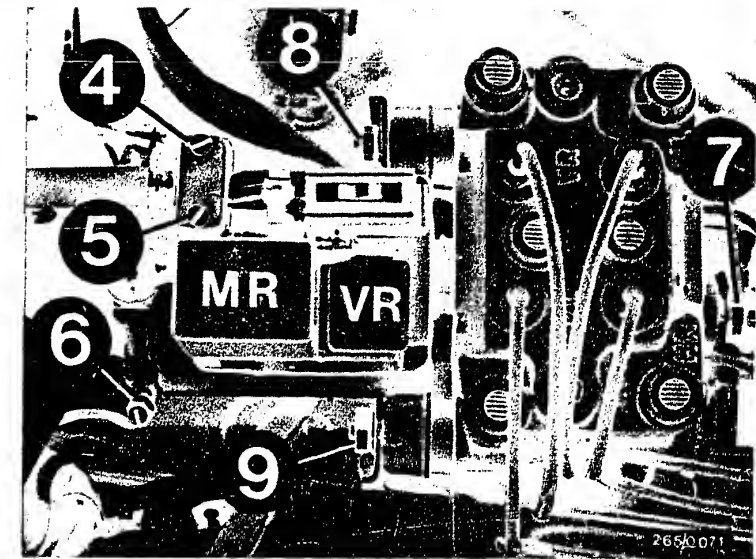
K10

Test with ABS tester
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Replacing the hydraulic modulator (continued)

- Use only the specified double-end flare nut wrench 9x11 mm for loosening and tightening the brake lines.
- Mark brake lines and remove from hydraulic modulator.
- Catch the brake fluid and do not bring it into contact with your skin or clothing or with paintwork.
- Immediately seal the brake lines and connections with dummy plugs.
- Disconnect ground cable (6) from pump motor.
- Loosen fastening screw and remove cover.
- Loosen bracket (4, 5) and remove plug.
- Loosen hexagon nuts from holder (7,8,9) and remove hydraulic modulator.



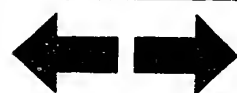
Installation

- Mount hydraulic modulator in the holder and fasten with the hexagon nuts.
- Connect ground cable to pump motor. Plug on 13-pin plug and fasten with the bracket.
- Fasten cover on the hydraulic modulator with the screw.
- Connect the brake lines to the hydraulic modulator in accordance with the markings.
- Observe the tightening torque for the brake-line connections on the hydraulic modulator: 12...16 Nm.
- Bleed the brake system and check for leaks.
- Fully test the ABS with tester.

4 and 5 = Screws for wiring harness strain relief
6 = Ground terminal for pump motor
7,8 and 9 = Fastening points for hydraulic modulator
MR = Return-pump relay
VR = Valve relay

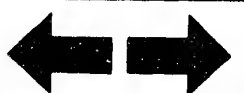
K11

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K12

Test with ABS tester
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TEST STEP 48 (for control unit of generation 2B)

<u>Operation:</u>		<u>Reading:</u>	<u>Testing:</u>
Program-selector switch position	24	Digital display unit must indicate <u>10...15 V.</u>	<u>Component:</u> Stop-lamp switch
<u>Operation in vehicle:</u> Switch on ignition. Press brake pedal.			<u>Operation:</u> Signal
Test specification reached?			<u>Malfunction:</u> Reading less than 10 V

Yes

No

Testing with the ABS tester completed.
As a final test take the vehicle for a trial run:
With the engine running, indicator lamp must go out.
Drive at min. 30 km/h.
Indicator lamp must not light up again.

Note: Tester must be converted for generation 2B.
Trouble-shooting:
No reading: Check stop-lamp switch including plug connectors and cables.
Reading less than 10 V: Stop lamps defective, eliminate contact resistances at plug connectors or replace stop-lamp switch.

K13

Test with ABS tester
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K14

Test with ABS tester
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After-sales Service

Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

NO REPAIRS PERMITTED ON
ABS HYDRAULIC MODULATOR

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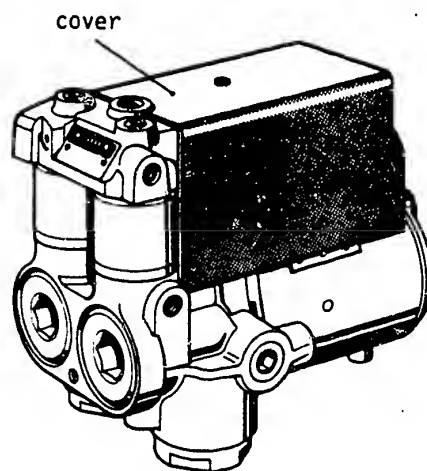
In all technical descriptions attention is drawn to the fact that ABS is a piece of safety equipment. As for all safety equipment in motor vehicles special legal specifications also apply to ABS. This is to prevent the faultless functioning of these systems being impeded by unqualified handling.

With ABS the hydraulic modulator in particular is a component which can be damaged by such tampering.

We would point out that the hydraulic modulator must under no circumstances be repaired. For safety reasons it must be exchanged as a complete unit.

It is only permitted to exchange the motor and valve relay after removing the cover (see picture).

All other screws and plugs, whether with locking paint or not, must not be removed.



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Technische Mitteilung

BMW 628 CSI, 633 CSI, 635 CSI



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